WIRE AND WIRE PRODUCTS

AUGUST 1942

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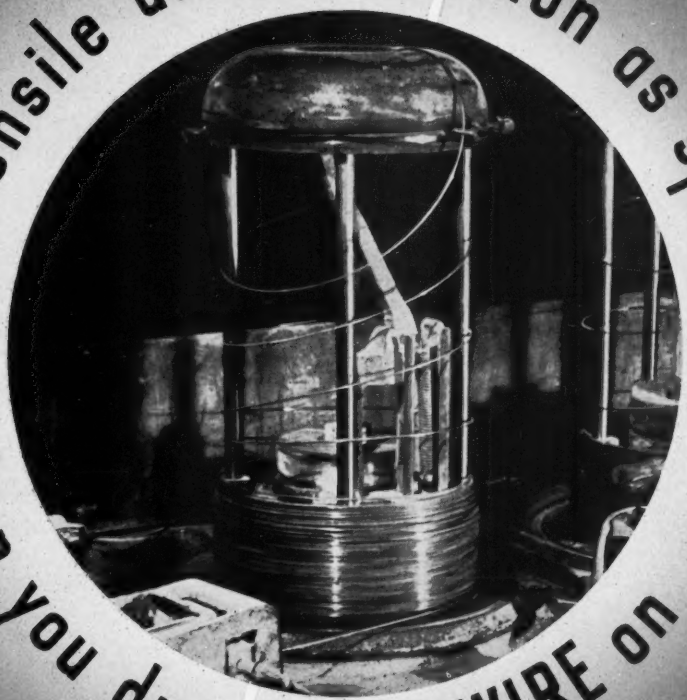

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WORCESTER, MASSACHUSETTS

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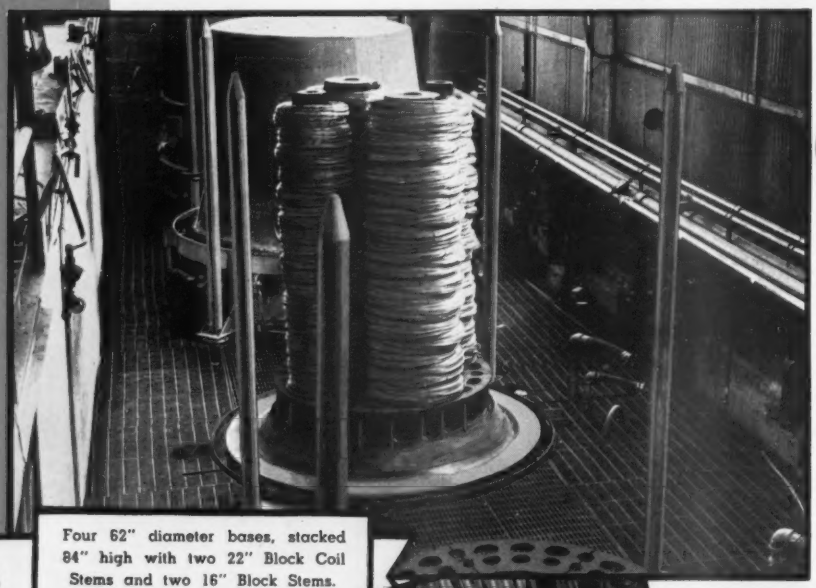

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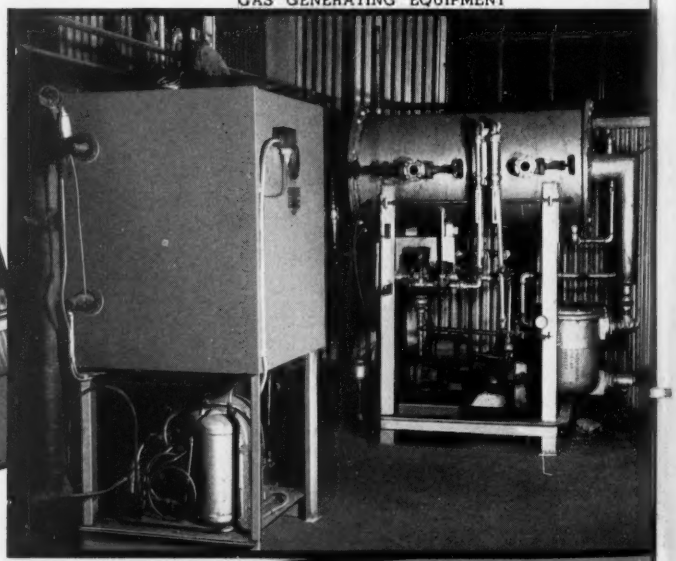

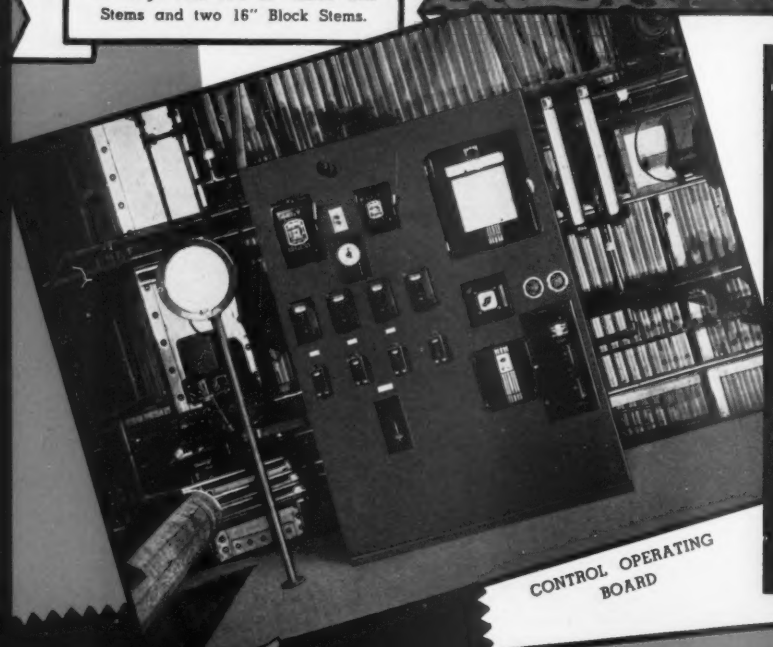

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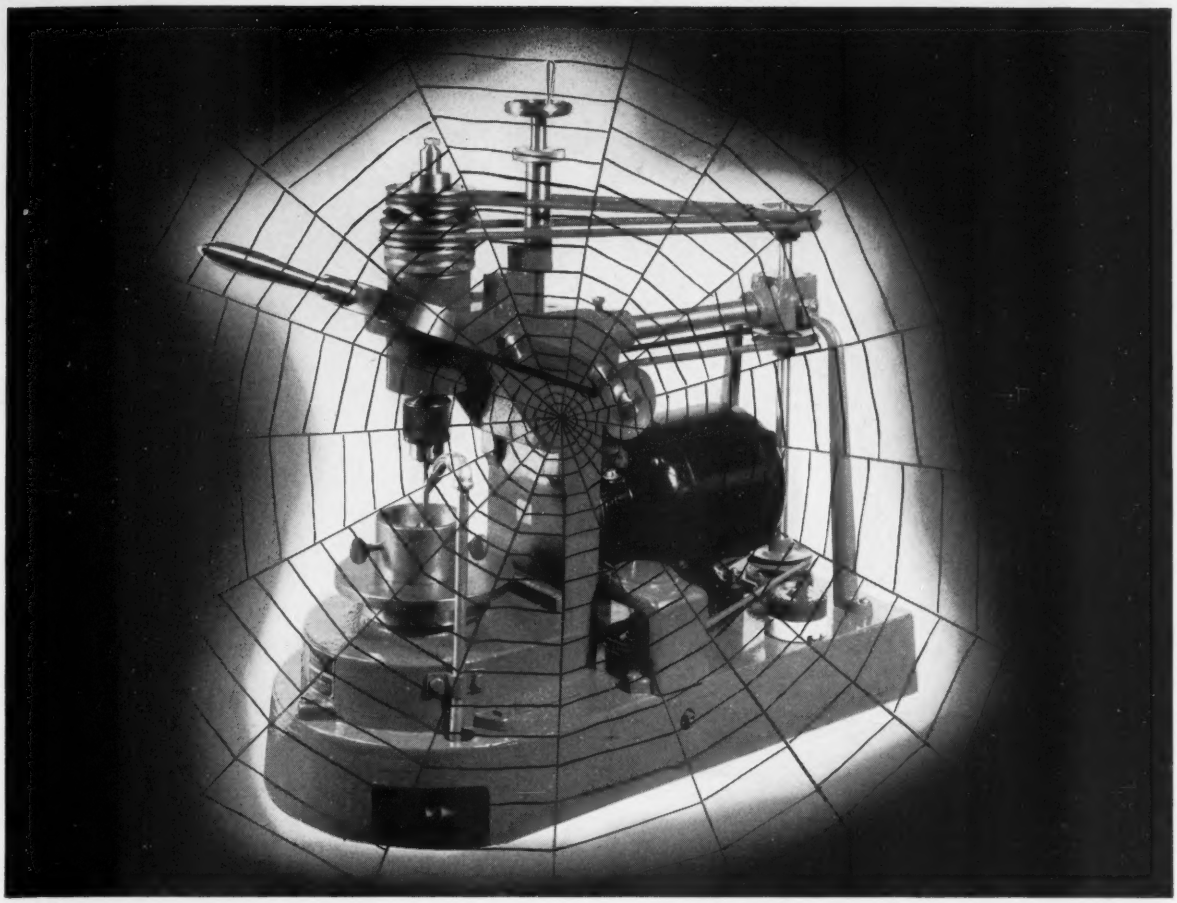

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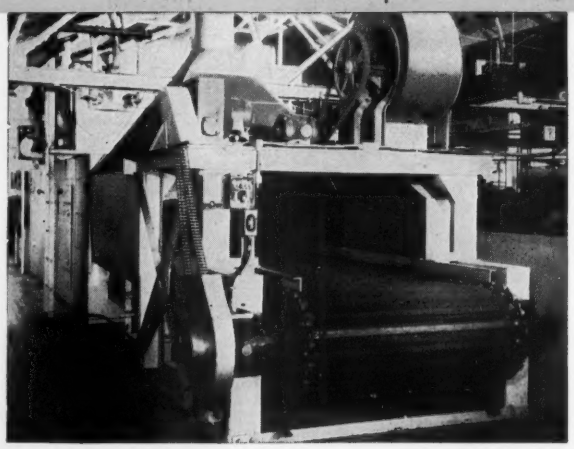

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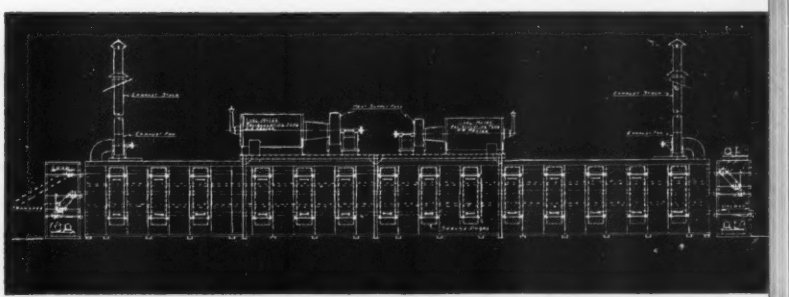

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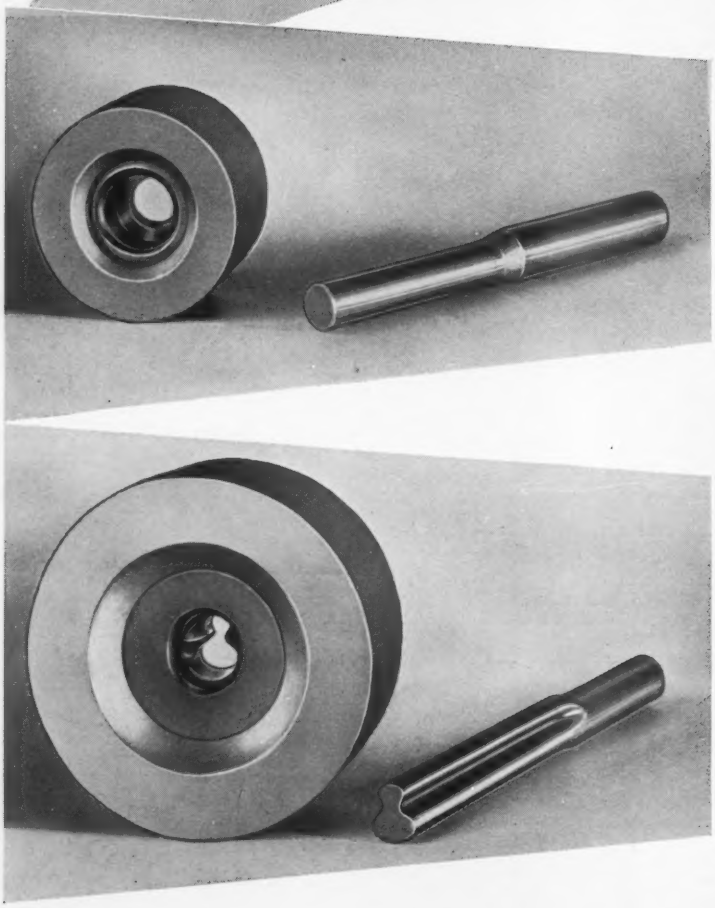

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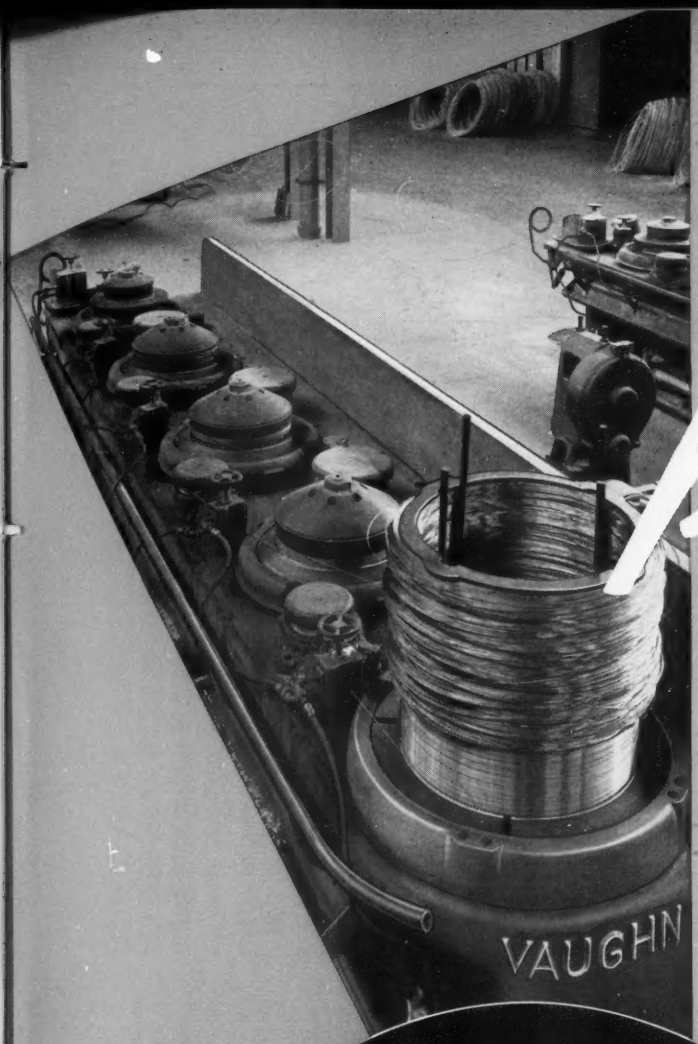

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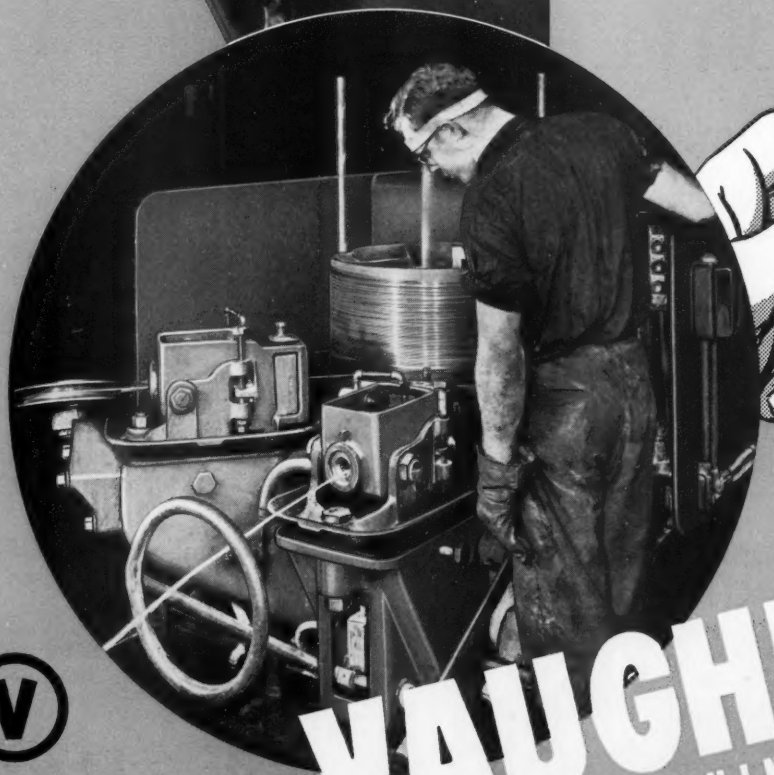

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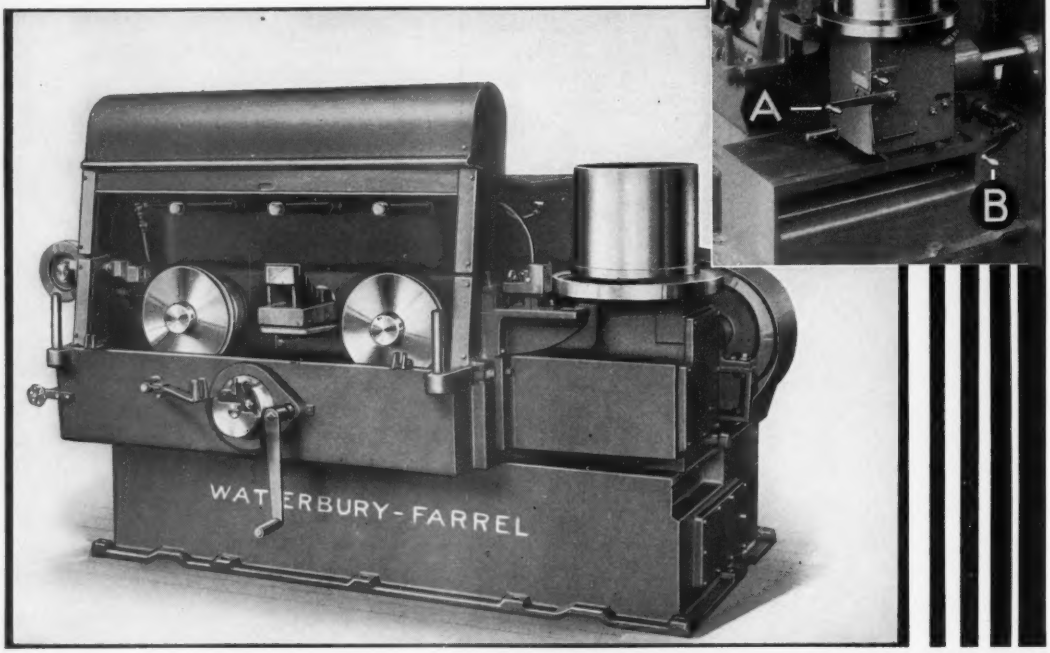

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 17 AUGUST, 1942 No. 8

Designated as

Official Publication By The Wire Association

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Publication Office: Washington, N. J.
Executive Office: Stamford Trust Co. Bldg., 300 Main St., Stamford, Conn.

Annual Subscription, U. S. $5.00, Canada $5.00

50 Cents a Copy in U. S. Issued Monthly Foreign, $7.50

October Convention Issue $1.00 a Copy
January Convention Discussions Issue $1.00 a Copy

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WIRE & WIRE PRODUCTS, Vol. 17, No. 8, August, 1942, Executive Office, 300 Main St., Stamford, Conn. Published by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secretary and Treasurer. Publication office, 13 West Church Street, Washington, N. J. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 cents per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Washington, N. J., under Act of March, 1879.

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AND THE

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DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 17 AUGUST, 1942 No. 8

The Effect of Copper On Hot-Dip Zinc Coatings

By Wallace G. Imhoff,
President,
The Wallace G. Imhoff Company, Vineland, New Jersey

The available evidence indicates that a small copper content will increase the corrosion resistance of hot-dip zinc coatings. Research Engineers are constantly striving to improve the quality of their product. Even as it is there is no substitute as good as, or better than a hot-dip galvanized coating to protect iron and steel against corrosion, but this industry has never been satisfied to believe that nothing is left to do in the field of research, to see if it is possible to obtain a still better hot-dip zinc coating. It is with this constant idea of always searching for ways to improve the product that the writer wishes to focus thought upon a little known subject, namely, the effect of very small copper additions to the zinc coating with the idea of improving its corrosion resisting qualities. ✦ ✦ ✦ ✦ ✦

What Grounds Are There for Such Belief?

IT is only natural that the question, "What grounds are there for such a belief?" should suggest itself. The answer to this question is found in submitting the available evidence on the subject. The evidence alone might not be enough to arouse any suspicion that such is the case, but when the available evidence is reviewed with a background of practical iron and steel melting practice, and a wide practical knowledge of zinc smelting and hot-dip galvanizing, suspicions are aroused that copper in zinc coatings will perhaps improve their corrosion resistance in the same proportion as copper in small amounts has done to steel. The ideal galvanized product therefore from the standpoint of corrosion resistance, should be a product that has a copper-bearing steel base metal, a copper-bearing zinc coating, and highly skilled technical galvanizers to put the zinc coating on the base metal correctly. That condition of producing the superlative galvanized product from the corrosion resisting standpoint therefore must obtain all three of these factors. At present there are only two, a copper-bearing steel base metal and expert galvanizing practice in applying the coating.

Copper in the Base Metal

IN his report, "The Corrosion of Copper-Steel Fence Wire (1), Oliver W. Storey states—

1. It has been definitely established that the durability of old steel fence wire is due to the presence of copper.

2. Manganese does not increase the corrosion of steel, and its absence does not decrease the corrosion.

3. The copper in the early steel and wrought irons came from the copper-bearing ores of the eastern United States and imported ores. The proportion of copper-steel made decreased with the increasing importance of the copper-free Lake Superior ores.

4. Steel fence-wire containing copper is as durable as wrought iron.

5. Present-day steel fence wire usually does not contain copper and therefore corrodes rapidly.

6. Under ordinary atmospheric conditions zinc corrodes more slowly under conditions favoring rapid corrosion of iron, and vice versa, iron corrodes more slowly under conditions favoring rapid corrosion of zinc.

7. The life of fence wire is dependent upon the quality both of the galvanized and iron or steel base. Since the galvanizing is usually thin, the life of the fence depends principally upon the iron or steel base, which should be highly corrosion resistant.

Designated as Official Publication by the Wire Association

FROM the above conclusions it would appear that a fourth condition must be added to give the superlative zinc coating, and that in addition to the small copper content suggested, as heavy a zinc coating as is practical should also be applied.

✦ ✦ ✦

D. M. BUCK (2) in his paper on **"Research on the Corrosion Resistance of Copper Steel"** states the following conclusions—

"Copper increases the resistance of steel and iron to atmospheric corrosion. Its influence is apparent when the copper content reaches .03 per cent. Its effect is almost at a maximum when the copper reaches .05 per cent. .25 per cent copper has been chosen as the best amount for commercial steel. Steel containing .25 per cent copper outlasts "Pure Iron" containing .05 copper.

Steel containing .05 per cent copper lasts as long as "Pure Iron" containing .05 per cent copper.

The influence of copper is probably due to its control of the sulphur.

Sulphur in steel accelerates corrosion very markedly.

Sulphur oxides in the air accelerate the corrosion of steel.

Copper in steel counteracts or retards both corrod-influences."

✦ ✦ ✦

IN an earlier number of **Wire and Wire Products** which the writer for the moment cannot locate to give the reference, the following interesting article is given on the life of some early wire.— ✦ ✦ ✦

"IN 1859, Bee's Wire Grapevine was started between Placerville and Old Virginia City, Montana. It was completed in 1861. It is of more than passing interest to stop and examine the chemical composition of this wire. It was found to be a very pure wrought iron, remarkably free from impurities such as carbon, manganese, sulphur, and copper. Its composition is given below—

Carbon	**.014**
Manganese	**.056**
Sulphur	**.028**
Copper	**.037**

✦ ✦ ✦

EVIDENTLY the copper in this wire has been more beneficial than suspected in so far as prolonging its life is concerned.

✦ ✦ ✦

THE references are in abundance testifying to the value of small additions of copper to the base metal to increase its resistance to corrosion. Many references to all this scientific work were published by the **American Sheet and Tin Plate Company, Pittsburgh, Pa. (3).**

✦ ✦ ✦

Vital Points About Copper in Steel

THIS discussion is not on copper in the base metal, but it has been absolutely necessary to give some discussion to this phase in order to round out the whole discussion, and more particularly to call to attention the one conclusion which states, "The influence of copper is probably due to its control of the sulphur." As a practical steel melter the writer soon learned that "an oxidized heat" almost always was high in sulphur, and that the slag not only contained much sulphur but also the molten steel. As it escaped it could easily be recognized by its choking sulphur smell. Another important statement which should not be overlooked is No. 2 of **Oliver W. Storey,** which is—"Manganese does not increase the corrosion of steel, and its absence does not decrease the corrosion." Here again as a practical steel melter the significance of this conclusion must be explained, as it too has a definite bearing on the discussion later on. Both copper and manganese take up the sulphur in steel. Good steel is always made in the furnace, and not in the ladle. It is for this reason that many of the finest steel melters always add Spiegel to the bath about one half hour before tapping the heat. The addition of the Spiegel which contains manganese just a short time before tapping the heat is for the purpose of cleansing the bath of both oxygen and sulphur; oxygen in the form of manganese silicate and sulphur in the form of manganese sulphide. In addition to this the steel itself is also cleansed, and the melter looks for his olive green "velvety slag" as the practical indication that the heat is in fine condition to tap.

WALLACE G. IMHOFF
President of The Wallace G. Imhoff Company, Vineland, N. J., and Technical Director of Research, American Hot-Dip Galvanizers Association, Pittsburgh, Pa.

✦ ✦ ✦

MODERN steel making practice appears to have eliminated this fine practice of adding Spiegel to the furnace about a half an hour before tapping. (4) Demands of more and more production have evidently assumed that the same effect can be obtained quickly in the ladle, as was obtained by slow "simmering" for a half an hour in the furnace before tapping. The change of melting practice is not a point for discussion here. The point of vital interest is that both copper and manganese additions are beneficial because they tend to cleanse the steel of both oxygen and sulphur. How this is accomplished could also be the subject of another paper on steel melting practice.

✦ ✦ ✦

Zinc Also Contains Sulphur and Oxides

THE writer has purposely avoided any discussion on steel melting practice since that is a matter of each melter's opinion. Turning now to zinc we find that a large part of the zinc is obtained from "Black Jack", or "zinc blend", zinc sulphide. In Wisconsin it is found with the lead ore "Galena, lead sulphide".

✦ ✦ ✦

THE ores are put through separators and then the Sphalerite is roasted to reduce the sulphur, after which it is further reduced in zinc retorts in the zinc smelters. Even the highest quality slab zinc still contains some sulphur. The writer has a vivid recollection in melting down some slab zinc in one galvanizing pot, of the yellow sulphur that had condensed on the outsides of some of the slabs. Also in melting down the metal in the galvanizing pot, and during gal-

vanizing operations oxides and inclusions in the zinc occur just the same as oxides and inclusions in steel. Thus if small additions of copper to steel are beneficial, it would seem logical that with the same impurities, sulphur and oxides, that the addition of a very small amount of copper to the molten zinc bath (galvanizing bath) should be beneficial in cleansing the bath, and also in adding to the corrosion resisting qualities of the zinc when small amounts of copper are found in the zinc coating.

✦ ✦ ✦

Metal and Alloy Additions to the Galvanizing Bath Difficult To Understand

THE reason that there is so little information in the galvanizing literature as to the relative merits of adding copper to the galvanizing bath, is because so little is known about actually what does happen, and what is the effect of making many different metal and alloy additions to the galvanizing bath. The writer has discussed metal and alloy additions to the galvanizing bath in the **American Metal Market** (5) and in **Metal Cleaning and Finishing** (6) so that that very complicated subject can only be referred to in the light of copper additions to the galvanizing bath, and the influence of copper in zinc coatings. A very thorough search of the literature has not revealed a single instance where any definite research work has been done in which actual tests were made on the failure and life of zinc coatings without any copper content, and zinc coatings with a copper content. This should be an extremely interesting, practical, and fertile field for the **American Society of Testing Materials** to conduct some careful research investigations on. The tests would be made to study the difference in corrosion resistance of zinc coatings without copper and zinc coatings with copper. The base metal in the tests should also be an ordinary steel without copper and a steel base with copper. It can at once be seen that a number of practical combinations can be made up for the tests, such as for example, a base metal without copper with a zinc coating with copper, vs. a base metal with copper and a zinc coating without copper; or a base metal without copper with a zinc coating without copper vs. a base metal with copper and a zinc coating with copper. Many additional variables can be devised, in addition to still another variable the weight of the zinc coating on the base metal. Such research work is a long and tedious problem and to obtain full accurate results the tests should be made by such a recognized authority as the **Society for Testing Materials.** Many copper-bearing base metal test results are available, but no mention in most of them is made as to the actual chemical analysis of the zinc coatings protecting the base metal. It is assumed that all of these zinc coatings are non - copper - bearing zinc coatings. The same tests with copper-bearing zinc coatings might show a considerable longer life, and much greater corrosion resistance.

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Available Knowledge About Copper Bearing Zinc Coatings

IN reviewing the literature in search of all available information of practical interest and value to the galvanizer we find that the field of discussion must be divided into a number of different distinct phases. These distinct phases are—(a) Copper in Zinc; (b) Copper in the Galvanizing Bath; (c) Copper in Galvanizing Pots; (d) Copper in Zinc Coatings; (e) the effect that copper has on the corrosion of zinc coatings; and (f) Copper in Galvanizing By-Products—1. Dross; 2. Oxide Skimmings; and 3. Sal-Ammoniac Skimmings.

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(a) Copper in Zinc

IT is recalled that the copper content in the early irons was said to be derived from the iron ores. Thus if we find any copper in slab zinc we should expect it to come from zinc ores. According to the **Data of Geochemistry** (7) eleven zinc ores are listed, and not one shows any copper content. However **Schnabel** states (8) the following—

"Copper was found by Eliot and Storer in New Jersey zinc. Zinc from Missouri was found to contain 0.0013 to 1.1123 per cent copper, and 0.0002 per cent was found in zinc from Upper Silesia. Karsten found that ½ per cent of copper makes zinc harder and brittle—so much so that it showed ragged edges on rolling, and could not be rolled without cracking."

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ACCORDING to **H. E. Brauer and W. M. Peirce** (8) "If copper is present in zinc in a very small quantity it seems to have a protective effect". A most valuable and enlightening statement on the subject comes from a paper by **C. H. Mathewson, C. S. Trewin, and W. B. Finkeldey,** (9). They state, "Even the most promising metal, copper, appears to be considerably less soluble in solid zinc than the figures quoted above would indicate; we have been unable to introduce much more than 1½ per cent of copper into solid solution in zinc. There is hardly enough copper present in the alloy used in the tests just described (1 per cent) to alter its mechanical properties to any great extent—1 per cent of copper in zinc does not greatly modify the metal; it requires some 10 to 20 per cent to produce a marked change in properties."

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THE examination of a couple of hundred analyses of various brands of zinc used for galvanizing does not in any case reveal more than a trace of copper. Thus for all practical purposes it may be stated that there is no copper of any significance in ordinary slab zinc for galvanizing. Since the ores contain no copper this is what would be expected.

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THE writer has found copper in various quantities in remelt zincs (10). It is stated in this reference, "Metallic copper is not commonly present in commercial grades of zinc. The alloying elements are usually lead, iron, and cadmium. Sometimes present, but in much smaller amounts are tin, arsenic, antimony, and bismuth. Traces of copper are found in electrolytic zinc. According to the **New Jersey Zinc Co.** the zinc lat-

TABLE I—ANALYSES OF REMELT ZINCS

Copper	Tin	Lead	Iron	Cadmium	Zinc
.84	1.27	2.28	.09	.13	95.39
.13	...	.53	.09	.13	99.22
..	.56	.98	.05	.72	97.69
.396	.505	1.87	.303	.373	Balance zinc
Trace	.15	1.50	.24	...	" "
Trace	1.00	1.40	.43	...	" "

tice will hold between 1.5 and 2.0% of copper in solid solution depending on the temperature. The presence of copper in solid solution hardens zinc to some extent but does not affect the rolling properties adversely.

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"PRIME Western" zincs do not contain copper but remelt zincs which are at times used in hot galvanizing do contain small amounts of copper as illustrated in Table I.

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THUS it may be stated that standard Prime Western Slab zinc does not contain copper, and that even in Remelt zincs the copper content is shown in six cases to be under 1% in copper content, with 5 out of 6 zincs containing under .4% copper.

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(b) Copper in the Galvanizing Bath

THE first question is how can copper get into the galvanizing bath. The answer is in the zinc, in metals and alloys added to the galvanizing bath, and third, by deliberately putting it in. The first item, in the zinc has just been covered. The second item, in commercial alloys added to the bath, we find that the chemical analysis of an addition commonly made to the galvanizing baths, shows a copper content of 0.044 per cent. This as seen is very little. The third item, by putting in deliberately has been described by the writer in reference (10) which is the following—

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"THE alloying action of the galvanizing bath upon copper is illustrated by the analysis of a bath where a few small copper tubes had been galvanized. A ladle full of zinc lifted from the kettle showed the following chemical composition—

Zinc	98.66
Lead	.93
Copper	.015
Iron	.043
Aluminum	.004
Cadmium	.350

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"ONLY the purest prime western metal was used in this pot and the copper contents of the bath were derived solely from the attack of the molten zinc at galvanizing temperature upon the copper tubes which were put through the bath. This is of course a very small percentage of copper."

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THE same reference (10) discusses a test made on **Everdure**, a copper alloy of the following composition—

Chemical Composition of Everdure	
Copper	94.76%
Silicon	4.13%
Manganese	.74%
Phosphorus	.06%
Iron	.04%

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"THE results of these tests conclusively show—

1. **It is not practical to try to zinc coat Everdure.**
2. **Copper alloys are readily attacked and dissolved by molten zinc at galvanizing temperatures.**
3. **The lag screw not only lost weight by galvanizing, but the molten zinc attacked and destroyed the threads.**
4. **The zinc coating did not adhere well to this alloy."**

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IN still one other example the writer watched the smile come over a practical galvanizer's face when he tried to hot-dip galvanize a light copper wash boiler, and finished with just the top hoop band of the tub in his tongs. Finally for test purposes and experimental purposes the writer has deliberately added small quantities of sheet copper to the galvanizing bath to study the effects of copper in various quantities in the bath.

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THE writer has records of at least two practical galvanizing baths which carry copper, both of which companies were purchasing "remelt" zinc for their pots. A range boiler and tank galvanizing bath had the following chemical composition—

Zinc	98.66%
Lead	.93%
Copper	.015%
Iron	.043%
Aluminum	.004%
Cadmium	.350%

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A PIPE galvanizing bath that came under the writer's supervision, and which was supplied with "remelt" zinc for metal additions, showed the following analyses—

Lead	1.02%	0.96%
Iron	.13%	.11%
Tin	.11%	Trace
Cadmium	.11%	.04%
Copper	.02%	Trace
Aluminum	None	.04%

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AT this time it is of interest to call attention to the fact that not in a single one of these galvanizing plants was any objection ever offered in regard to the zinc coatings for any cause, and that includes the copper content in the baths.

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(c) Copper in Galvanizing Pots

THE question also in this connection of copper in zinc coatings has brought up another one of interest which is — How does the copper content of steel effect the destruction of the galvanizing pot? Firebox steel and Flange or Boiler Rivet steel are the standard materials from which hot-dip galvanizing pots are made. It is therefore of much practical interest to hear what **Mr. R. J. Barrow, Secretary of The Columbiana Boiler Co., Columbiana, Ohio,** has to say on the subject. In a personal letter to the writer **Mr. Barrow** states—

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"THE general analysis of galvanizing pot steel is as follows—

Carbon	.15 Max.
Phosphorus	.04 "
Manganese	.40 "
Sulphur	.05 "
Silicon	.02 "

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AS to the copper content of the steel **Mr. Barrow** states—"We believe that the time is opportune for the study of the merits or the detrimental effect of copper content in galvanizing kettle steel.

We have found that a copper content of .06 to .08% has not been harmful in one case. However, the popularity of copper-bearing steel in industry causes us to believe that some steel may be high in copper and we do not know what effect that would have. We believe that very few copper tests have been run on galvanizing kettle steels and you may be interested in that point."

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FROM the information we have available there is no doubt that a very small copper content in galvanizing pot steel is not harmful. On the other hand as can readily be seen, there is a point at which the copper content would actually greatly accelerate the pot destruction. Where and what point this is in copper content can only be discovered by actual tests of losses by hanging samples of pot steel with varying copper contents into the galvanizing bath. Just off hand and with no data or facts other than we have available it is the writer's opinion that this copper content must be kept under 0.5% at least. It is believed that higher copper content would actual accelerate pot destruction.

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(d) Copper in Zinc Coatings

IT is really very surprising on making a very thorough search through the technical literature on corrosion, how much data and information are available on copper-bearing steels, and how little information and discussion and technical facts there are available on copper in zinc coatings. Even today the information and data are so scarce that almost no definite, conclusive statements can be made as to the service that small additions of copper in zinc coatings perform.

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RAWDON in his book, **"Protective Metallic Coatings" (11)** p. 68 in Table 3, gives the chemical composition of some commercial hot-dipped zinc coatings on sheet iron and steel. The table is given below. Special attention is called to the copper content in the zinc coatings as shown in Table II.

TABLE II—COMPOSITION

Fe	Sn	Pb	Cu	Sb and Al	Zn
			Per Cent		
3.7	0.10	0.80	0.90	not detected	95.31
3.5	.70	.72	.06	" "	95.02
3.2	.22	.71	.05	" "	95.82
2.7	.08	.82	.02	" "	96.38
3.1	.73	.81	.02	" "	95.34

IN discussing Table II it is interesting to note that **Rawdon** does not mention the copper content in the zinc coating. He states, "The results summarized in Table 3 show the composition of the coating on five different commercial zinc-coated sheets of American manufacture. According to these results, none of the manufacturers had used aluminum but all the coatings contained nearly the same amount of lead. Tin had evidently been used intentionally by at least three of the five."

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IN searching through hundreds of references there is much information available showing that copper-bearing steels are the most resistant to corrosion. However in almost every case the chemical analyses refer to the base metal, and even when there is a zinc coating on the copper-bearing steel, no reference is made to the chemical composition of the coating, and of course no special reference to the copper content of the zinc coating, if it does carry any copper. The actual analyses of zinc coatings are few, and there is almost no information at all especially in regard to the copper content of the zinc coating, or galvanizing bath. It is really amazing to find so very many technical articles have been written on copper-bearing steels as a base metal for galvanizing sheets, and yet in every single reference consulted there was not a single analysis given for the zinc coatings on any of the copper-bearing sheets used in the tests. It is the writer's opinion that almost as great an improvement will be found in adding copper to the zinc for zinc coatings in small amounts, as has been found in adding copper in small amounts to steel. In other words the best corrosion resistant galvanized sheet would be a copper-bearing steel base, with a coating of copper-bearing zinc, with the heaviest zinc deposit consistent with perfect performance of purpose, and put on with the very best possible sheet galvanizing technique. The copper-bearing zinc coating should give a longer zinc coating life than a plain zinc coating, and the copper-bearing steel base has already been proven superior in corrosion resisting qualities over the plain steel base.

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(e) The Effect That Copper Has On the Corrosion of Zinc Coatings

IN view of the fact that there is almost no available information on this subject, items here and there in the literature will be cited to determine which way the direction points in regard to the value of copper in zinc coatings as a factor of corrosion resistance. We find some most valuable hints in some references of **Brauer and Peirce (8).** On page 2 they state —"Copper to the extent of 0.5 per cent is a powerful retarding agent and in any amount up to 5 per cent is more or less beneficial". This statement is made in reference to its influence on oxidation. Again on page 18 of the same reference we find the statement, "The pure zinc-aluminum alloy showed considerable corrosion. In alloys containing small quantities of copper, corrosion had just become visible." Also on page 20, "The harmful effects of lead, cadmium, tin, and iron, respectively, as well as the beneficial action of copper, etc., etc." and then finally in the summary, page 30 we find much of interest which is quoted below—

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First—It is seriously accelerated by the small amounts of lead and cadmium,

which may be found in many grades of zinc.

Second—It is accelerated by tin.

Third—Nickel and manganese have a slight accelerating effect on the rate of corrosion.

Fourth—It is materially retarded by small percentages of copper.

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ADDITIONAL information on Copper-Zinc alloys is given by **W. M. Peirce** in his paper, **"Studies of the Constitution of Binary Zinc-Base Alloys** (12), pages 5 and 6. An amount of 1.50% copper is given for copper in solid solution.

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IN regard to the corrosion of zinc in the atmosphere in a Bulletin, **"Rolled Zinc"** (13), page 46 under the heading of "Rate of Corrosion in the Atmosphere" we find the following comments — "The variations in composition among commercial grades of zinc have not been shown to have any important effect on the rate of atmospheric corrosion, although there is some evidence that lead tends to decrease the corrosion somewhat. Certain zinc alloys containing elements not normally found in commercial grades of zinc show an even lower rate of corrosion than the commercial grades." It is possible that the authors have in mind alloys containing copper, although they do not mention this fact. Perhaps one of the most valuable references for throwing light on the subject is that given in **"Galvanizing"**, a book by **Heinz Bablik (14)**, p. 310. He states, "The importance of the purity of the zinc is thus demonstrated very clearly; whereby it must be remembered that already, a hundred years ago, **de la Rive** ascertained that the solubility of zinc in acids increase in the order—distilled water, zinc with tin, zinc with lead, zinc with copper, commercial zinc." The only question here is whether zinc with copper in it is better than commercial zinc. Tests and experiments made by much later investigators that have already been cited in references seem to indicate that zinc with copper in it is superior in corrosion resistance to commercial zinc. This would change the order of the de la Rive series and place commercial zinc before zinc with a small copper content.

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ON page 41 of **"Zinc and Its Corrosion Resistance"** (15) published by **The American Zinc Institute** we find the following—"The potential series of metals with regard to their susceptibility to corrosion by water, as determined by measuring their solution pressures, was reported by **Weston** to be as follows—aluminum, zinc, iron, nickel, lead, tin, and copper." Thus alone we find copper is excellent in its corrosion resistance to water. There is therefore no reason to believe that additions of small amounts of copper to the galvanizing bath, should do anything other than increase, or add to the corrosion resistance of the zinc, rather than accelerate its destruction. On page 56 of the same reference (15) we find—"If copper is present in zinc in a very small quantity it seems to have a protective effect." And on page 65 of the same reference (15) we find—"The protective effect of a small amount of copper on the corrosion of zinc is reported by **Prost,** who states that a small quantity of copper seems to have a very protective effect."

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RAWDON, (11) on page 77 of his book states — "Antimony in amounts from 0.03 to 0.07 per cent seemed to have accelerating effect on corrosion, whereas small amounts of copper, even a few hundredths of one per cent, appeared to exert a protective action." **Burns and Schuh** (16) page 101 state substantially the same as **Rawdon** in regard to the effect of copper.

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SOME very interesting light is thrown on the matter by **Sir Robert Hadfield** in his paper, **"A Practical Trial of Roofing Sheets of Copper Steels and Other Materials" (17).** We find the following on copper steels, "The trials concern galvanized sheets, both painted and unpainted, of the following materials: (a) Copper-bearing steels of two different names; (b) ingot iron; and (c) ordinary unalloyed sheets as currently employed. Copper-bearing steel is proving definitely superior to ordinary steel, but its merits did not appear until the galvanized coating had weathered off."

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(f) Copper in Galvanizing By-Products

THIS item need only be treated very briefly. If the galvanizing bath contains any copper, the dross is bound to show the same amount since the dross is made up of zinc-iron alloy crystals with the bath frozen around them.

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AS to the effect of copper in the galvanizing bath on the skimmings, a few years ago the writer conducted some research work on a full-sized galvanizing bath in regard to the effect of small copper additions to the bath. Up to a certain point the copper simply dissolved and went into solution in the bath with no visible outward effects, and apparently no harmful results. However there came a point at which the bath appeared to have taken up all the copper it could take up at galvanizing bath temperatures. This point was indicated by the appearance of a "red copper oxide smear" coming all over the finish of the zinc coating. It was clearly seen that no more copper could be added to the bath without destroying the galvanized finish appearance because of this "ugly red copper oxide smear". Unfortunately at the time the tests were interrupted and the writer was taken away before getting a sample of the galvanizing bath to see how much copper it had taken up. Even without an analysis of the bath the writer knows the copper content was extremely small, perhaps 0.1 of 1 per cent and not as high as .2 of 1 per cent. Only a few very small pieces of sheet copper were added to the bath before the red oxide danger signal appeared showing clearly that no more could be added without ruining the finish of the product. Nothing was ever heard in any way in regard to the quality of the product either in tests in the plant, or after leaving the plant. The small copper content

(*Please turn to Page 422*)

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A Discussion of Coated Electrodes And Their Properties

By R. O. Waldman,
Western District Manager,
Chicago Steel & Wire Co., San Francisco, Calif.

A paper presented before a meeting of the Local Chapter of the American Welding Society at San Francisco, Calif., on January 23rd, 1942. ✦

A LITTLE more than a decade ago, the use of coated welding electrodes began to spread rapidly. Since, in order to make an arc weld successfully, a substantially constant arc length had to be maintained, it was found a thin coating to automatic welding wire tended to stabilize the arc and control the melting rate.

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IN the early days of the automobile, owners were interested in mechanical features, and discussed such points as "sliding gear transmission", "three speeds forward and reverse", "splash or force feed lubrication", etc., and every car owner could tell you the bore and stroke, RPM and horsepower of his motor. In time, however, these matters ceased to be of interest and people today buy cars largely on outside appearance, taking the mechanical features for granted.

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TO a lesser degree, coated electrodes, or welding rods, have passed through a similar phase, except that we have arrived at the stage of taking them for granted within the few years after their introduction. This is probably due to the fact that there is little or nothing particularly impressive about the appearance of a welding electrode. It possesses no "sex appeal", but here is one case where appearances are deceptive, for these simple looking coats, in each instance, represent many years of the intensive laboratory development work at the hands of a very few inspired geniuses, who have been blessed with a special welding sense. This, added to a background of from ten to twenty years experience, embracing all of the stages through which welding rods have passed, has resulted in the present day high quality electrodes.

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IT is universally known that heavy coated, protected arc mild steel electrodes are faster, have better working properties, produce better weld metal than bare rods, but we are prone to accept the coating as something of a contributing factor, rather than as the main factor that it is.

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BUT if you want to get a more effective example of what a coating can be made to do, just take a bare stainless steel rod, or a high tungsten alloy rod, and try to run it—it just can't be done! So then you say, "Put a coating on it", just like that! And here's all you need to do: You start off by finding a chemical or mineral that has an affinity for one certain element in the steel, others that may be required to serve as a reagent, others to provide the gaseous envelope to protect the crater against oxygen, others to impart smooth operating characteristics, eliminate spatter and undercutting, assure proper penetration, and then the entire combination must be made to work in harmony, and, in the case of alloys, to deposit weld metal at least as good as, or superior to the parent metal; in strength of from **25 to 50% greater than the very wire from which the rod was made!**

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THE steel from which mild steel electrodes are made is in general of the same analysis as the old bare rods were, the ranges running from around .06 to .18% carbon, with the other elements in proportion. Each manufacturer chooses the type that he favors, and then develops coatings to fit the rod, and it may be necessary to try many thousands of combinations of coating materials, before the best possible results are obtained. In other words, the old method of "trial and error".

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WELDS made with bare rods will run in tensile strength at about 80% of that of the wire and parent mild steel metal, while the ductility drops way down to about 6% to 7% elongation and the weld metal is full of oxides and nitrides. Knowing that this is caused by exposure to oxygen and nitrogen as the metal passes across the arc, the answer is to provide protection against this by utilizing the heavy, inert gases produced by the combustion of the materials comprising the coating. This is the first and very important step. ✦ ✦ ✦

BUT, how do we go about this? We know about the lady who became noted for the wonderful Irish stew she made. One day she was asked to give her recipe; she answered, "Shure there's nothin' to it atall; ye takes all the ingredients and ye put 'em in a pot, and annywan that knows the least bit about cookin' should know the rist." ✦ ✦ ✦

DESIGNING an electrode coating is a bit more complex than that, for here's what the coating must do: Enable the welder to employ considerably higher current than with bare rods, provide an average of three times the

welding speed, increase the tensile strength from say 45,000# p.s.i. for bare rods, up to a minimum of 65,000 and maximum of almost 80,000# p.s.i. for coated, and increase the ductility by nearly 400%, and all this without depositing any strengthening alloys, except possibly to replace some of the manganese and carbon that would be burned up in the arc. This is a case of where, contrary to Nature's law, we get **something** for nothing, and it also establishes the fact that if it were possible to melt and pour the steel in the first instance, with a reducing atmosphere similar to that created in the protected arc crater, this steel should then also register in tensile strength, ductility and corrosion resistance, characteristics, equal to that of protected arc mild steel weld metal.

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IN addition to this, the conditions of use and application determines the particular kind of coating to be put on the rod. Is it to be of the reverse or straight (negative) polarity type, for D.C. or A.C., for high speed flat position welding, or for all position, (flat, vertical and overhead) and so on? Every special alloy rod, such as stainless steel, high manganese, high carbon, hard surfacing, etc., requires specially designed coatings to fit.

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HOW are these coatings made? There are no text-books on the subject and probably never will be. There appears to be an infinite number of materials: organic, carbonaceous, mineral, mineral earths, chemicals, etc., which, in proper combination, will provide coatings suitable for the different metals and types of steel. ✦ ✦ ✦

WITH so wide a variety to choose from, the problem of proper choice, even of the basic materials, becomes quite complex, and I believe I am safe in saying that every rod manufacturer's coating differs from that of every other, each aiming at the attainment of all the desirable qualities, but arriving at the goal by a different route.

TO date, no universal rod has been designed; that is to say, no one rod that will work equally well on reverse or straight polarity, or one that can be used on vertical and overhead and yet will equal in speed a rod that is made for high speed, flat position welding only. On the contrary, whenever some special feature is called for, it usually can be produced only at the expense of some other characteristic. But at all times such essential features must be retained, as will produce the necessary qualities of a good weld.

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A MATHEMATICAL shark once stated that with as few as ten ingredients, it was possible to produce over ten million combinations, and thus, if we start from scratch with the ten known variables, the permutations and combinations are such that it would be a miracle if any chemist or metallurgist could duplicate the coating on any rod produced by another. This has been repeatedly tried and fortunes expended trying to produce marketable coated electrodes, but as yet there are only a mere handful of men who have the background of experience, skill and ability to qualify in that field. Naturally, all of their formulae are kept secret and guarded jealously, as they are considered priceless assets.

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PRACTICALLY all of the heavy coated rods on the American market are of the "extruded" type. That is to say, the coatings are applied in somewhat plastic form under tremendous pressure by complicated machinery. Rods are pushed through die holes and then further processed, including a precise and controlled drying. The texture of the coatings should be dense and as free as possible from materials that pick up moisture from the air. This density results from the degree of pressure with which the coating is applied ✦ ✦ ✦

UNDERCUTTING, undue splattering of weld metal, erratic arc, are all due to improperly designed coatings, but in rare cases it may be found necessary to sacrifice one point in slight measure, in order to achieve some other feature that may be deemed more desirable. ✦ ✦ ✦

THIS paper has gone to some length to emphasize the point that rods of different make, but of similar type often differ from each other materially. We know that all rod manufacturers subject their products to the most rigid tests for physical and welding properties before placing them on the market, and thus it can be assumed that the products of any manufacturer of standing are of acceptable quality. While the arc welding principle in general is the same for all rods, there are certain small points of technique in which they may differ from each other, and unless these are given due consideration by the welder, he is certain to have trouble, or at least, he will not be able to get the results that his rod is capable of producing.

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FOR example: some coatings are made of materials having refractory qualities and these may require higher current settings of the welding generator; this high setting again compels the welder to lengthen his arc somewhat more than normal for that size rod. Another coating combination calls for fairly high amperage setting and low open circuit voltage, whereas still another coating calls for lower amperage and high open circuit voltage, which latter serves to liven up the arc, yet the actual welding current will be about the same for both types of setting. Still another coating calls for a short arc which will deposit a minimum of slag, another, a very heavy mineral type of slag. Each of these variations will require a slight variation in the welder's technique to secure the best results. ✦ ✦ ✦

IT becomes evident that a welder should not condemn a rod merely because it does not show its best properties when used with the technique and machine setting required by another rod to which he has become most accustomed,

(*Please turn to Page 425*)

ATTEND AMERICA'S WAR CONFERENCE ON METALS

THE TIME	October 12 to 16, Monday thru Friday
THE PLACE	Cleveland's Public Auditorium
THE EVENT	The National Metal Congress and War Production Edition National Metal Exposition
THE THEME	Increased Production Of War Products

• You've seen and shared in the rising production schedules of America's great metal industry. You've seen and helped this big industry "beat the promise" month after month in this war of metals.

You know that war has developed new products and new processes and new ideas — you've contributed your share. These aids to greater production will be discussed when the metal industry meets in Cleveland.

You are urged to attend this war conference on metals where your ideas and the developments of others can be made available to all, in contacts and conversations with men you know or should know. Meet with the four great technical societies in a hundred technical sessions. Consult with hundreds of manufacturers' experts in their educational displays, and with representatives of government — to speed production and win this war.

• *Sponsored by the American Society for Metals, in cooperation with the American Welding Society, the Wire Association, and the Iron and Steel and Institute of Metals divisions of the American Institute of Mining and Metallurgical Engineers.*

More than 200 manufacturers have already taken display space in this 100% educational meeting. 83% of all available space has been assigned. Companies serving the metal industry are urged to participate and put their technical experience and information on the war production line, where it will do the most good TODAY.

For display information, write
AMERICAN SOCIETY FOR METALS
7301 EUCLID AVENUE • CLEVELAND, OHIO

The Origin of Wire Drawing Dies

By Paul Grodzinski,

Technical Consultant, Industrial Diamond Review,
London, England

On reading Kenneth Lewis' Mordica Memorial Lecture, "The Shape of Things to Come", Paul Grodzinski, Technical Consultant for Industrial Diamond Review, London, England, was inspired to take pen in hand to contribute further information to the die lore set forth by Mr. Lewis. ✦

AS much as I appreciate the elucidating way in which **Mr. Kenneth B. Lewis** connected the early history of wire drawing with the problems of today in his most interesting paper, **"The Shape of Things To Come"** (Wire and Wire Products, Jan., 1942), I do not fully agree with his conclusions with regard to early dies. He says the early dies must have been iron, possibly hardened by cementation, but in my opinion, early dies were most probably of stone material. I do not doubt that the stones he investigated served for the smoothing of leather strips, but considering ancient technique, there are many proofs that the old artisans could drill stones; but I have not yet found any proof that they could drill iron with equal dexterity to relatively small diameters.

✦ ✦ ✦

I DO not know which more modern sources **Mr. Lewis** has used, but I found some years ago an old German textbook by **Lesjugo** published in 1744 in Luebeck, in the Library of the Patent Office in Berlin. This most interesting old book contains valuable information on the production of dies of steel for both coarse and fine wires. With regard to the production of very fine wires, in particular of gold and silver, there appeared the following quite obscure notes, which I have translated into English:

"The wire drawing plate for fine wires is very different from that for coarse wires. Whereas the latter consists of a good steel on the part containing the hole, the other or small drawing plate consists of a material which at the present time even from the standpoint of wire-drawers, is not yet really recognized. The plates are of a remarkable property as one can practically drill them easily and softly; they are, however, very brittle so that if one hammers them they easily break into pieces. The inside looks like silver, but the material, in contrast to silver, is very brittle as mentioned before. Therefore, one is led to the conclusion that they may consist of a distinct portion of regula antimonia, as the latter can under certain conditions be alloyed to appear as white as silver, and makes iron and steel brittle throughout when it is molten and thoroughly blended with the former."

✦ ✦ ✦

THIS quite mysterious description some years ago led the writer to the assumption that **Lesjugo** may have thought of diamond and sapphire dies, inasmuch as these dies are very hard and brittle, should never be hammered, and further because the inside looks like silver. Of course this is inconsistent with the statement that they are soft and easily drilled, but this may perhaps be considered as a kind of propaganda for these draw plates, and if we include the words "in the hand of experts," the statement then appears to make sense. The other remarks on pure antimony and its effects on iron and steel are doubtless only intended to indicate the experience and knowledge of the old writers in the field of metallurgy, as it is well known that antimony induces to brittleness in metal alloys in which it is used.

PROFESSOR F. C. **Thompson,** only recently (Metal Industry No. 5, 1942, p. 72) stated:

"The earliest reference to the use of diamond and similar dies of which the writer is aware . . . is the British Patent of Brockedon in 1819."

The present writer can only confirm this statement, as far as actual facts and available evidence are concerned. When evaluating the worth of the **Patent of Brockedon,** however, it must be considered that British Patent practice refers only to the application of the invention in England, and there is no evidence that Brockedon is really the inventor of the drawing die made of precious stones. There is a similar, and in the opinion of the writer a related instance, more than 100 years before this patent, that some Swiss mechanics obtained a British Patent in the year 1704 for improved watch bearings, consisting of a hole drilled in precious stones, preferably sapphires and rubies.' When these gentlemen applied for an extension of their patent it was objected to on the ground that such stones had already been used before. Of course, upon investigation it was found that the watchs referred to contained only stones for ornamental purposes. It seems very plausible that the Swiss mechanics already had knowledge of this improvement when they came to England.

✦ ✦ ✦

WHAT has drawing to do with a watch bearing? At first the holes have a great similarity,

and in the old days the same material was used, sapphire or ruby, and further the process of production must have been the same. Considering the foregoing, when it is confirmed that holed stones of sapphires and rubies existed before the year 1700, there is much in favor of the theory that **Lesjugo** did mean inserted stone drawing plates.

✦ ✦ ✦

IN view of the fact that wires as f ·e as a woman's hair were know.n in the sixteenth century, at a time when watches were probably first begun to be made, the writer likes to invert the hitherto known evidence, by stating that according to his opinion, the inserted stone drawing die, seems to be far older than watch bearings and that probably the first watch bearings were just used drawing dies.

✦ ✦ ✦

FULL evidence may perhaps only be obtained by a very careful study of records that exist in the archives and libraries of the French and Swiss Jura. In those places from which came supplies of the majority of both diamond drawing dies and watch jewel bearings may lie the secret of the original die. The most conservative wire drawing artisans may possibly never have used for very fine wire what may be called a malleable die, which can be hammered, and they may have insisted, right from their ancestors in the stone ages, on the use of wear resisting stone materials for their tools.

Diamond Dies

Query And Answer Column

Edited By Paul L. Herz

A recent Wire Association inquiry asked what standard stone sizes of diamond wire drawing dies were used by American die manufacturers and a number of interesting replies received and the differences of opinion contained therein, is published herewith.

This in turn suggested the desirability of establishing a Query and Answer column on die problems which is presented herewith and edited by Paul L. Herz, Diamond Die Expert. In view of the lack of standardized practice in the handling of dies, wire drawers have experienced many difficulties to the solution of which this column will be dedicated.

Questions covering all matters affecting dies, die machinery, die up-keep, die making and diamond powders, will be answered in this column.

Question A

"In an article written by Mr. H. M. Padowicz in the October 1941 issue of WIRE & WIRE PRODUCTS, it is mentioned that the stone size of diamond wire drawing dies is standardized by American wire die manufacturers, and if possible, I should be glad to know what these standards are."

✦ ✦ ✦

Answer A

By Mr. Padowicz. "With regard to the request noted in your letter of April 2, 1942 for specific data as to the stone size of diamond wire dies, which have been standardized by the American Wire Die Manufacturers for copper wire drawing, we feel that this information should be directly obtained from these people. It is regarded by them as of a confidential nature though it is generally known to the purchaser.

We have found that the natural, round diamond stones (clear and free from imperfections) which meet our diamond die quality requirements are of a standard stone size furnished by the American wire die manufacturers."

The preceding question and answer resulted in a letter being sent to American die manufacturers and this has led to a number of interesting replies which follow:

✦ ✦ ✦

Answer No. 1

"To the best of our belief, there is no practical standardization regarding a carat weight of stones in proportion to the size of dies yet satisfactory. This is due because of the fact that there are so many various size diamonds for wire drawing dies, whose thickness and diameter entail so much variation that it would not be possible for one to definitely standardize a selection of stones for dies. I believe that you would appreciate this fact if you would stop to consider that a stone might be very thin and have a great diameter in proportion to its thickness and weigh one-quarter of a carat, and at the same time there might be a stone, many times smaller in diameter but round, and it would also weigh a quarter of a carat.

If you can see through this example which I have set forth, I believe that you will understand our position in stating that there is no possible set form to follow in the selection of stones for diamond dies."

✦ ✦ ✦

Answer No. 2

"Wire Die Manufacturers of the U.S.A., have not regulated the stone size of Diamond Wire-drawing Dies in conformity to a standard.

However, a general tendency seems to exist to use a better grade round stone, which system we had advocated for many years. The writer was one of the first ones, who as far back as 1926, used a patented setting in which best quality, globular, clear diamonds of lighter weight in reinforced mounting were used, for we never believed in the

theory that the heavy weight of a stone alone is a guarantee for its endurance.

We cannot speak for other die manufacturers, but believe that, providing very best quality clear, near globular diamonds without defects or carbon spots are used, the following could be used as a guide:

.057″ — 1.75 carat
.030″ — 1.00 carat
.010″ — 0.30 carat

with proportional steps for the intermediate sizes, also for larger or smaller holes."

✦ ✦ ✦

Answer No. 3

This producer of Diamond Dies enclosed a list of standard weights used by them, which may be of interest to others. For purposes of comparison the table follows:

✦ ✦ ✦

Answer No. 4

We do not believe there is any standardization as to stone size used in the various diamond wire drawing dies.

We have from time to time had occasion to make some comparison of same with different manufacturers and find that there is some wide variation in use."

✦ ✦ ✦

Question B

"What is the effect on the diamond die of the quenching in cold water at a temperature of between 750 to 800 C of a beryllium copper setting?

Standard Weight for Diamond Dies

Size	Ave. Ct. Wt.
.0013 to .0016	.15 to .20
.0017 .0021	.20
.0022 .0025	.20
.0026 .0028	.20
.0029 .006	.20
.0061 .0099	.25
.010 .0113	.27
.0114 .013	.30
.0131 .0142	.30
.0143 .016	.35
.0161 .018	.40
.0181 .0205	.45
.0206 .023	.50
.0231 .0253	.55
.0254 .029	.65
.0291 .032	.70
.0321 .036	.80 to .90
.0361 .041	.90 1.10
.042 .046	1.10 1.25
.047 .052	1.25 1.40
.053 .058	1.40 1.60
.059 .065	1.60 1.75
.066 .073	1.75 2.00
.074 .082	1.80 2.25
.083 .091	2.00 2.50
.092 .102	2.00 2.50

Answer B

By Paul L. Herz. "Replying to your query about the effect on the diamond die of the quenching in cold water at a temperature of between 750 and 800 C of a beryllium copper setting I will say that it does not injure the diamond in the least.

However, a die or so may break during the process due to indirect causes which can be avoided: For instance:

1. If your die stone is very flat, odd shaped, or elongated, the pressure exerted on the stone by the cooling metal may be unevenly distributed and cause breakage.

2. If you use diamonds of unstable structure (whether Brazilian or not), such as deep brown or deep yellow twinned stones, stones with air bubbles, and flaws, etc. The same would apply to an aluminum bronze setting."

✦ ✦ ✦

Reply by inquirer: "I found your statement regarding diamonds of unstable structure being the cause of a lot of my troubles to be correct. I also find diamonds of alluvial origin and round in shape, most successful for diamond dies.

My chief concern was the setting, as I have been experimenting for the last five years with various alloys by cold pressing the metal around the diamond and casting. The best results I obtained by die cast in beryllium copper."

Hotel Carter

THE WIRE ASSOCIATION OFFICIAL HEADQUARTERS

October 12-17, 1942

Cleveland's leading Convention Hotel and gathering place for world famed personages.

Chosen by THE WIRE ASSOCIATION

BECAUSE: THE CARTER houses the famous RAINBOW ROOM and twenty-five other individually styled meeting rooms.

BECAUSE: All bedrooms and suites are beautifully appointed.

BECAUSE: It is noted for fine food and attentive service.

May we advise THE WIRE ASSOCIATION members to make early and direct reservation with THE CARTER.

ALLEN JAMES LOWE
PRESIDENT - MANAGING DIRECTOR

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SALES MANAGER

Carbide Tools Increase Efficiency

By Paul H. Miller,
Chief Engineer,
The Carboloy Company, Inc., Detroit, Mich.

ONE of the most common erroneous beliefs in connection with the adoption of carbide cutting tools to speed production, is that the higher cutting speeds recommended for such tools impose greater forces on the work and tool. Actually, the opposite is the case more frequently than not.

✦ ✦ ✦

MANY a shop man has hesitated to use carbide tools for such reasons as:

1. **A belief that the increased rate of metal removal will increase the tendency for the work to slip in the chuck, or**
2. **That it will be necessary to tighten the chuck too much to prevent slipping and thus distort the work.**
3. **A belief that the increased cutting speed will cause long work to 'twist up' to a greater extent.**
4. **That there will be an increased tendency to distort thin wall (hallow) parts, etc., due to increased pressure of tool against work.**

✦ ✦ ✦

THE basis of such beliefs is probably the fact that the increased rate of metal removal by the machine, when carbide tools are used and the machine is speeded up, involves in turn an increase in horsepower required.

✦ ✦ ✦

ACTUALLY, the increase in horsepower required may be accompanied by a decrease in tool 'loads' and torque, as simple basic engineering considerations demonstrate.

✦ ✦ ✦

What Determines Tool Load?

FOR a given tool set-up, tool loads — pressure on the tool and by the tool on the work—are determined by two major factors: the cross-sectional area of the chip, and the nature of the material being cut. It can be expressed by a simple formula:

Total Tool Load (in lbs.) = (Feed in inches) x (Depth of cut in inches) x (a constant depending on the material) x 33000.

✦ ✦ ✦

THE value of the constant (see table) varies from 6 to 10 for different classes of steel, and from 3 to 5 for different types of cast and malleable irons. For all except the extremely hard bronzes and brasses, the constant is around 3 to 4. For the hard to machine non-ferrous metals it may run as high as 10.

Table of Constants for Calculating Power Requirements and Tool Loads for Various Materials

Material	Power Constant
SAE 1010 - 1025	6
SAE 1030 - 1095	8
SAE 1112 - 1120	6
SAE X1314 - X1340	6
SAE T1330 - T1350	9
SAE 2015 - 2320	7
SAE 2330 - 2350	9
SAE 3115 - 3130	8
SAE 3135 - 3450	9
SAE 4130 - 4820	9
SAE 5120 - 52100	10
SAE 6115 - 6195	10
Cast Steel	9
Cast Iron Hard	4
Cast Iron Medium	3
Cast Iron Soft	3
Cast Iron Hard (Alloy)	4
Cast Iron Medium (Alloy)	3
Cast Iron Soft (Alloy)	3
Cast Iron—Up to 25% Semi-Steel	3
Cast Iron — Over 25% Semi-Steel	4
Cast Iron Brake Drums	4
Cast Iron Chilled Rolls	5
Malleable Iron Hard	5
Malleable Iron Medium	4
Malleable Iron Soft	3
Brass & Bronze Hard	10
Brass & Bronze Soft	4
Aluminum Castings	3
Aluminum Bar Stock	4
Copper	4
Commutators	4
	127-164

✦ ✦ ✦

IRRESPECTIVE of the value of this constant, however, it will be noted that the actual 'tool load' is to all practical purposes independent of cutting speed.

✦ ✦ ✦

Cutting Torque

TO determine the cutting torque, which determines also the amount of twist or the tendency of the work to slip in the chuck, etc., it is necessary only to multiply the tool load figure by the distance of the tool from the center of the work.

✦ ✦ ✦

AGAIN it will be noted that speed has nothing to do with the subject.

✦ ✦ ✦

Horsepower

THE reason that more horsepower is required with carbide tools at higher cutting speeds is shown by the simple formula:

HP = (Tool Load as given above) x (cutting speed in ft. per minute) x 33000.

or HP = (depth of cut in inches) x (feed in inches) x (Surface feet per minute) x (the constant).

✦ ✦ ✦

THIS formula makes it evident that, even when the tool load is kept constant (that is, the feed and depth of cut are unchanged), the horsepower required increases whenever the speed is increased.

✦ ✦ ✦

THIS is the horsepower required for actual cutting.

(*Please turn to Page 419*)

✣ PROGRAM ✣

Wire Association Convention---1942

Cleveland, O., October 12-16, 1942. Association Headquarters — Hotel Carter

✦ ✦ ✦

The Exposition and Show of the National Metal Congress Will Be Open from Monday to Friday Inclusive, All Day and Every Evening During the Week Except Thursday Evening.

✦ ✦ ✦

Wire Association Headquarters at The Hotel Carter Will Be Open From 9:00 A. M. to 11:00 P. M. During the Entire Convention—Come and Get Acquainted!

✦ ✦ ✦

THERE WILL BE A REGISTRATION FEE OF $5.00 FOR THOSE ATTENDING THESE TECHNICAL SESSIONS AND INFORMAL MEETINGS

✦ ✦ ✦ ADMISSION WILL BE BY BADGE ONLY ✦ ✦ ✦

Open Discussions Will Be Held On the Papers Presented and These Discussions Will Be Published in the January, 1943, Issue of Wire and Wire Products.

PROGRAM COMMITTEE

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The Technical Sessions End Thursday in Order that Friday May Be Available To Make A Thorough Inspection of the National Metal Exposition.

MONDAY, OCTOBER 12

10:30 A. M.
DIRECTORS' MEETING

12 NOON
PROGRAM COMMITTEE LUNCH

Registration and Information. (Mezzanine of Hotel Carter) — October 12-16 — in charge of Mrs. R. S. Spengel, Secy.-Treas., WIRE & WIRE PRODUCTS.

✣ PROGRAM ✣

Wire Association Convention---1942

Cleveland, O., October 12-16, 1942. Association Headquarters — Hotel Carter

— TECHNICAL PAPERS —
WILL BE PRESENTED RELATING TO

Electric Patenting of Wire
Pickling of Rod and Wire
Wire Mill Safety Practices
Tungsten Carbide Applications
Bullet Core Wire Production
Non-Ferrous Wire Production
The Production of Welding Electrodes
Trouble Shooting on Bronze and Steel Weaving Wire
Planning the Wire Mill for War Production
Insulated Wire and Cable Production
Reclamation of Waste Material

THE MORDICA MEMORIAL LECTURE
To Be Presented By
Louis H. Winkler, Metallurgical Engineer,
Bethlehem Steel Co., Bethlehem, Pa.

SPECIAL FEATURES

WIRE ASSOCIATION ANNUAL LUNCHEON — HOTEL CARTER.

ANNUAL DINNER — STAG SMOKER — THE HOTEL CARTER

AMERICAN SOCIETY FOR METALS DINNER

ANNUAL MEETING OF THE WIRE ASSOCIATION

— PLANT DEMONSTRATION OF ELECTRIC PATENTING —

Hotel Reservations may be made by members of The Wire Association direct with the Hotel Carter, Cleveland, Ohio, *Prior to Sept. 28.* After that date no more reservations will be accepted for a specific hotel, but will all be referred to the Central Housing Bureau of The American Society for Metals for allocation to such hotel as may have space available. *Watch out for this — Make your plans now to attend and send your reservation card in promptly.*

THE WIRE ASSOCIATION MEDAL AWARDS

For the Most Meritorious Paper on Wire Manufacture or Fabrication During the Year.

MEDAL AWARDS

1934 — EDWARD J. P. FISHER

Metallurgist, Keystone Steel & Wire Co., Peoria, Ill.
Title of Paper: "COLD DRAWN STEEL SPRING WIRE"

1935 — BENJAMIN LEWIS McCARTHY

Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper: "GRAIN SIZE AND ITS INFLUENCE ON THE MANUFACTURE OF STEEL WIRE"

1936 — ROBERT NOTVEST

Chief Engineer, Welding Division, J. D. Adams Mfg. Co., Indianapolis, Indiana
Title of Paper:
"STEEL FOR ARC WELDING ELECTRODES"

1937 — BENJAMIN LEWIS McCARTHY

Chief Metallurgist, Wickwire Spencer Steel Co., Buffalo, N.Y.
Title of Paper:
"ABNORMAL GRAIN GROWTH AND THE ANNEALING OF LOW CARBON STEEL WIRE"

1938 — WALTER R. BLOXDORF

Metallurgist, The MacWhyte Co., Kenosha, Wis.
Title of Paper: "WIRE ROPE"

1939 — STANLEY P. WATKINS

Manager, Sales Development, Rustless Iron and Steel Corp., Baltimore, Maryland
Title of Paper:
"THE MANUFACTURE AND USE OF STAINLESS STEEL WIRE"

1940 — ROBERT W. SANDELIN

Metallurgist, Atlantic Steel Company, Atlanta, Georgia
Title of Paper:
"GALVANIZING CHARACTERISTICS OF DIFFERENT TYPES OF STEEL"

1941 — CARLETON W. GARRETT

Wire Mill Metallurgist, Jones & Laughlin Steel Corp. Aliquippa, Pennsylvania
Title of Paper:
"A BRIEF DISCUSSION ON THE MANUFACTURE OF STEEL FOR ARC WELDING ELECTRODES"

HONORABLE MENTIONS

1935 — L. D. SEYMOUR

Metallurgist, Rod and Wire Dept., Youngstown Sheet & Tube Co., Youngstown, Ohio
Title of Paper: "COLD HEADING WIRE"

1935 — R. A. SCHATZEL

Superintendent, General Research Laboratories, General Cable Corp., Rome, N. Y.
Title of Paper: "HARD AND SOFT COPPER WIRE"

1936 — BENJAMIN LEWIS McCARTHY

Metallurgist, Wickwire Spencer Steel Co., Buffalo, N. Y.
Title of Paper:
"PLASTIC DEFORMATION IN WIRE DRAWING"

1937 — ROBERT W. SANDELIN

Metallurgist, Atlantic Steel Co., Atlanta, Ga.
Title of Paper:
"A METALLURGICAL STUDY OF THE FACTORS AFFECTING THE QUALITY OF GALVANIZING"

1937 — ALLAN B. DOVE

Chemical Engineer, Canada Works, The Steel Company of Canada, Ltd., Hamilton, Ont., Canada.
Title of Paper:
"A. C. ELECTRO PICKLING—A BETTER METHOD OF PICKLING"

1938 — RODMAN R. TATNALL

Metallurgist, Morgan Works, Wickwire Spencer Steel Co., Worcester, Massachusetts
Title of Paper: "RESILIENCE OF SPRINGS"

1938 — JOSEPH A. DOYLE

Vice President, W. S. Rockwell Co., New York, N. Y.
Title of Paper: "HEATING COPPER WIRE BARS"

1940 — H. BLOUNT and J. D. WILTRAKIS

Mfg. Engineer, Point Breeze Works, Engineer, Kearny Works, Western Electric Company
Title of Paper:
"DESIGN AND OPERATION OF A NEW COPPER WIRE DRAWING PLANT"

1941 — RODMAN R. TATNALL

Metallurgist, Morgan Works, Wickwire Spencer Steel Co., Worcester, Massachusetts

Title of Paper: "TIME, TEMPERATURE AND SIZE IN THE HEATING OF STEEL WIRE"

ANNUAL MEDAL AWARD OF THE WIRE ASSOCIATION

FOR THE MOST MERITORIOUS PAPER ON WIRE MANUFACTURE OR FABRICATION DURING THE YEAR
— BY A MEMBER OF THE WIRE ASSOCIATION —

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Convention.

✦ ✦ ✦

AN annual medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

✦ ✦ ✦

CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

✦ ✦ ✦

ADDITIONAL information may be obtained by addressing:

✦ ✦ ✦

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Programme Committee and the Board of Directors of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association and the Board of Directors constitutes the Committee on Awards.

✦ ✦ ✦

RICHARD E. BROWN, SECRETARY, THE WIRE ASSOCIATION

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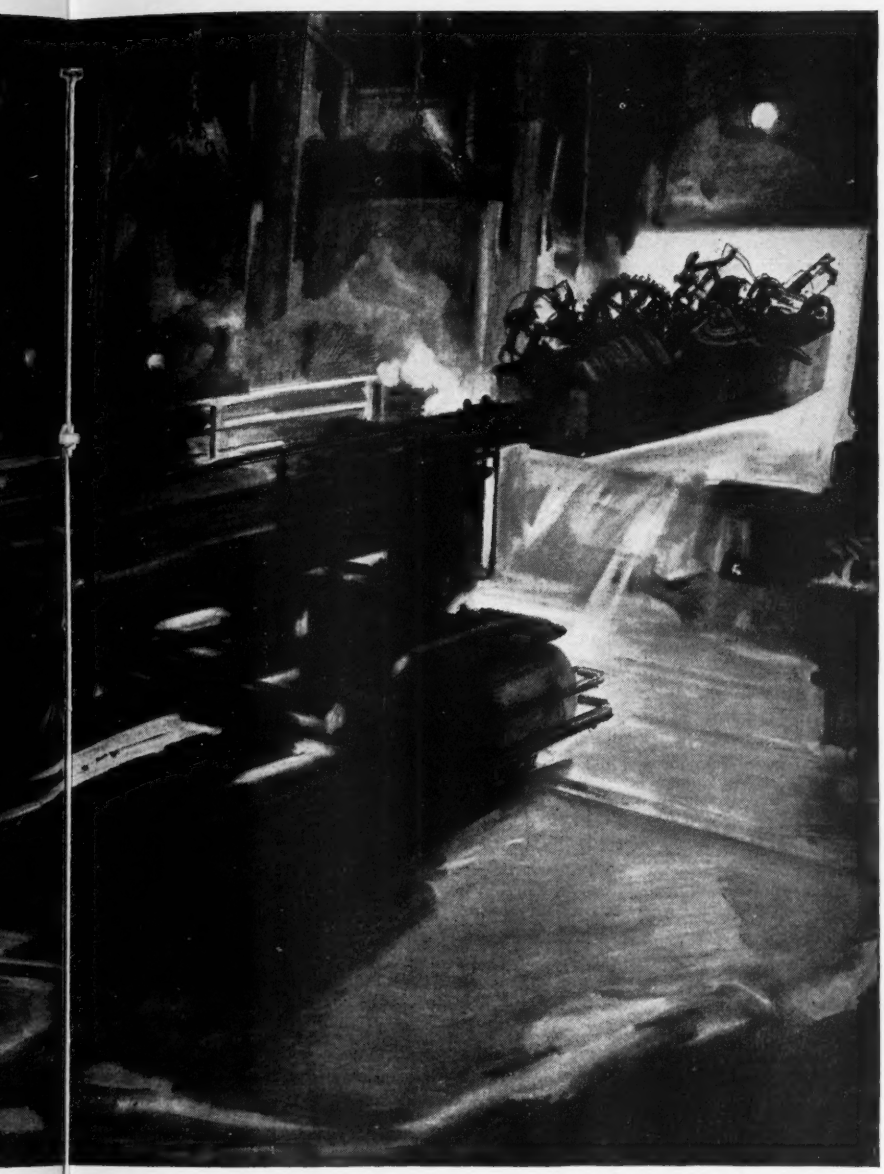
STEEL MEN USE SCRAP FOR MAXIMUM

Like coast artillerymen in action with huge railway guns, skilled steelworkers maneuver their hundred-ton charging machines on tracks up and down the batteries of open-hearth furnaces, charging load after load of scrap metal into the seething cauldrons to make strong, fighting steels. Millions of tons of steel scrap are required to keep these war furnaces going twenty-four hours a day, seven days a week.

In adjoining mill yards trained scrap-men load the charging boxes—rush them up to the charging line. Steel scrap, and plenty of it, is vital to making quality battle-steels at a record breaking pace. In the open-hearth operation scrap quickens the process—makes possible efficient use of the natural resources, iron ore, coking-coal and limestone.

Helping men of steel to obtain scrap now for their



FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

WAR-STEEL PRODUCTION

war furnaces enlists every industry and business — every farmer and householder. It partners everyone with the steel workers who are fighting this war with their skill and will-to-do.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA

PARTNER TO INDUSTRY IN WAR PRODUCTION

J&L STEEL

SCRAP

Like "mother" in vinegar, scrap steel in open-hearth furnaces activates and stimulates the process, gets refining action of whole batch going in right direction, particularly charge of new molten iron.

½ a battleship, or tank, or sub or big gun is iron or steel scrap that used to be in a discarded tractor, toy, rake, plough, kettle, tool, machine, auto, bathtub, refrigerator. The steel industry in general operates on the basis of 50% scrap, 50% pig iron. Scrap is sorely needed in the war production program. There are millions of tons of it rusting in factories and shops, on farms, in stores, around dwellings. A nationwide campaign is on now to collect and sell to scrap dealers this waste material so essential to winning the war.

The scrap dealer, who pays for waste material turned in to him by individuals, industries or civic and charitable groups, sells it in turn to industry at established, government-controlled prices. However, to make waste material usable for the mills the scrap dealer must properly sort, grade, prepare and bundle it, and also accumulate it in quantities sufficiently large to be shipped efficiently.

Hit Hitler with junk! Every piece of waste iron, steel, copper, brass, lead, rubber, around industrial premises, gathered up and placed where local salvage committees, or Boy Scouts, Girl Scouts, or charity organizations can collect and sell it, will be a blow to the axis.

Industrial executives, with authority to salvage obsolete machinery, tools, dies and all waste that has been created in their operations, are being asked to appoint salvage men, or committees, in their plants to go over the premises with a fine tooth comb and gather the last pound of salvageable junk—particularly iron and steel scrap—which is quickly usable and salable and readily turned into steel greatly needed for war.

Housewives help make bombs by turning in to local salvage committees their discarded appliances of iron or steel. A few hundred worn-out skillets or kettles will make one big aerial bomb.

Gifts of scrap may be made to local charities, service organizations or Defense Councils. If you wish to help government directly, sell your scrap, buy war stamps and bonds.

Obsolete factory equipment, cut up right now and sold as scrap through the regular channels will be a big contribution to our fighting forces. Equipment idle in a factory might also be considered for its immediate salable value as scrap material. The amazing industrial progress going on in America today, rapidly makes obsolete yesterday's machinery and appliances.

Farmers can bomb Tokio, 3 hits per minute for a couple of years, if they will rake up and sell every pound of scrap on the farm.

GOVERNMENT WIRE PRODUCTION INFORMATION

Three Steps to Stabilize Cost of Iron and Steel Products Announced by Henderson

THREE steps designed to stabilize further and make "fair and reasonable" the cost of iron and steel products to buyers, particularly to the Nation's armament makers, were announced June 26 by Price Administrator Henderson.

✦ ✦ ✦

IN Amendment No. 6 to Revised Price Schedule No. 6, on iron and steel products, effective June 30, these actions were taken:

1. Producers of iron and steel products were directed to file with the OPA data covering conversion and processing charges. The data, the Price Administrator said, will be studied to determine whether such charges are fair and reasonable, and whether any future regulation of them is necessary.

2. Uniform rules for the application of extras and other charges on cold finished steel bars and shafting were issued. These rules are designed to clarify such charges, and eliminate the possibility of the charging of several overlapping extras on the same product. This step, the Price Administrator said, will result in "substantial savings" to buyers. In many instances members of the industry have already voluntarily adopted the revised practices, so that the amendment, to some extent, merely standardizes existing pricing practices.

3. Conditions under which producers of concrete reinforcing bars are required to give discounts were defined by OPA. The Tennessee Valley Authority and Bureau of Reclamation, as well as concrete reinforcing bar fabricators, were listed as customers entitled to the discount of 25 cents per hundred pounds on such bars.

✦ ✦ ✦

COMMENTING on the request for data on conversion or processing charges, the Price Administrator said that in the past, steel mills have sometimes purchased billets or other steel from persons who were able to obtain such steel on the market and have processed or converted it under an agreement to resell. In these cases, the purchases by the steel producer and subsequent resale to the former owner have been at ceiling prices. With these sales, the Office of Price Administrator is not greatly concerned so long as the prices are within the permissible maximums, Mr. Henderson said.

✦ ✦ ✦

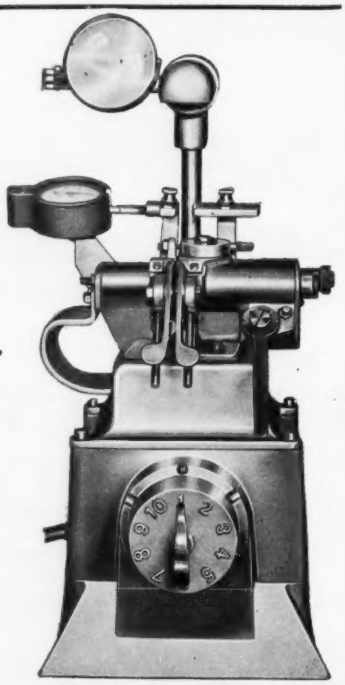
IN regard to the new uniform rules for the application of extras, the Price Administrator said that extras applicable to sales of cold finished steel bars and shafting, both in the carbon steel and alloy steel classifications, have for some time been confused. Both bars and shafting are highly important in the war program.

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



Model E.-I-S Welder Capacity .010 to .062" high & low carbon wire.

MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILL.

Telephone, State 7468

Cadmium Restricted

USE of cadmium will be restricted to essential military and civilian uses by an amendment to General Preference Order M-65. On and after June 24, 1942, the order as amended will permit the delivery of cadmium to distributors and to users only upon specific authorization by WPB. Formerly the order allowed deliveries on any order bearing a preference rating of A-10 or higher.

✦ ✦ ✦

USERS of cadmium must obtain authorization from WPB by filing Form PD-441 before delivery can be made or accepted.

✦ ✦ ✦

CADMIUM is particularly valuable as an electroplated protective surface against corrosive agents, such as sea water, and in manufacture of small precision parts. The potential requirements of the armed services are more than the entire supply. Since adequate substitutes, such as zinc, are available for less essential plating, today's amendment is issued to enable the Director of Industry Operations to allocate all cadmium for absolutely essential purposes.

✦ ✦ ✦

Critical Materials in Light Bulbs Curtailed

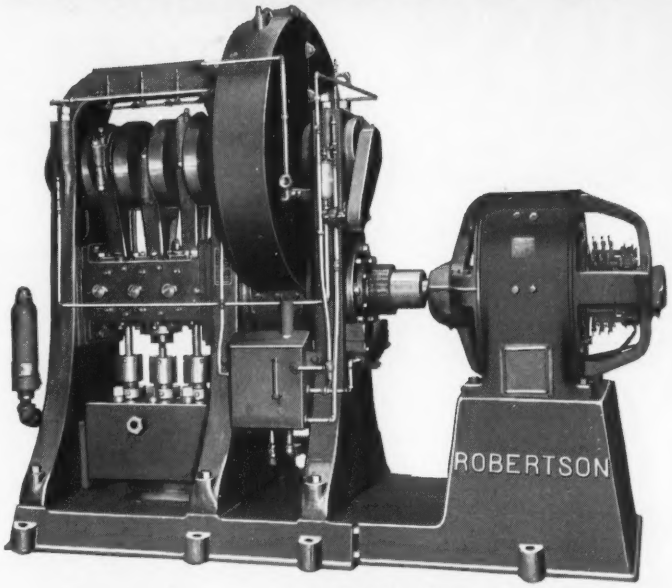
USE of critical materials in electric light bulbs has been curtailed, but production of light bulbs themselves was increased through compulsory use of substitutes. Limitation Order L-28 provides that after July 1 the following substitutes must be used: steel, plated with brass, instead of solid brass in bulb bases; iron wire plated with nickel and copper in lamp leads instead of half nickel and half copper; nickel-plated iron wire instead of nickel and molybdenum in filament supports. ✦ ✦ ✦

Plastics Molding Machinery

SPECIFICALLY defined, restrictions on production and delivery of new plastics molding machinery are imposed by provisions of Limitation Order L-159.

(*Please turn to Page 412*)

ROBERTSON



Remember ... any Hydraulic machine is only as good as the pump upon which it depends for operation!

The following 14 Features of Construction are the result of 85 years of experience and effort and insure every Robertson Pump giving the utmost of economy and service:

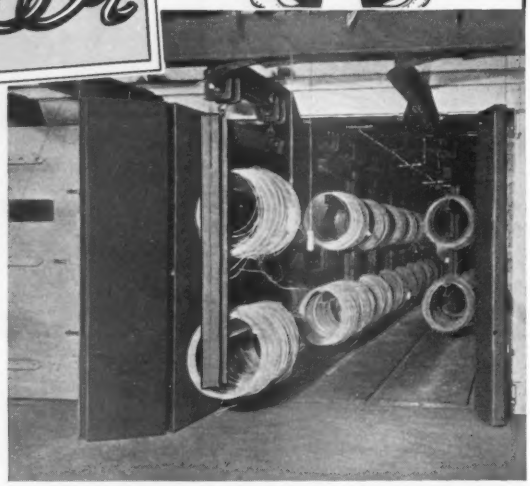
1. Sight gauge showing the flow of oil which is delivered into gear case.
2. Oil feed pump for gear-drive and all shaft bearings.
3. Oil filter for filtering oil from oil feed pump.
4. Timken roller bearings on pinion shaft.
5. Flexible coupling connecting pump and motor.
6. Oil storage tank of large capacity with pump feed to eccentric and main shaft bearings.
7. Bronze bonnets on pump chamber—they will not rust.
8. Solid forged steel pump block with removable bronze valve seats.
9. Deep packing chamber to insure long life of hydraulic packings—easy to get at.
10. Spring-balanced hydraulic safety relief valve of sufficient capacity to take the full capacity of pump without undue increase in pressure.
11. Non-rust steel plungers, ground and polished.
12. All eccentric and main bearings bronze-lined.
13. Sight feed oilers for all eccentric and main shaft bearings.
14. Herringbone gear-drive in cast iron oil tight case.

Consider the above features. Their value has been proved by years of actual performance wherever this type of equipment is used. Complete information on request.

All types of lead encasing machinery for rubber hose and electrical cable manufacturers, including Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Hydro-pneumatic Accumulators and Lead Sheath Stripping Machines.

JOHN ROBERTSON CO., INC.
125-137 WATER STREET, BROOKLYN, N. Y.

It's the new ROSS Wire Baker



..that shortens the baking cycle

A modern "must" for Wire and Rod Mills that need increased production and improved quality of product. The Ross Baker circulates high temperature air, clean and free from all products of combustion, to greatly speed up drying. Troublesome rusting and irregular lime coating are eliminated—quality is improved. Air Heaters use any oil or gas fuel available.

Ask Us About Revamping Your Present Equipment

Before recommending a new baker our engineers will determine whether your present unit can be revamped. Write our nearest office.

J. O. ROSS ENGINEERING CORPORATION

Main Office—350 MADISON AVENUE., New York, N. Y.

CHICAGO—201 North Wells Street DETROIT—12953 Greeley Avenue

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

Government Wire Production Information

(*Continued from Page 411*)

THE action was taken to prevent production of such machinery for non-war purposes and to assure an adequate supply of the machinery for manufacture of plastic articles needed in the war production program.

✦ ✦ ✦

THE order lists five different types of "approved" orders which may be accepted and filled by manufacturers of molding machinery. Such machinery includes:

✦ ✦ ✦

Plastic Injection molding presses.
Plastic Compression molding presses, hydraulic, automatic, mechanical.
Plastic Extrusion molding presses.
Plastic Preforming presses.
Plastic Laminating presses.
Plastic Tube and Rod Molding Presses.
Plastic Tube Rolling Machines.
Plastic - bonded Plywood Veneer Presses.

✦ ✦ ✦

APPROVED orders are defined as follows:

✦ ✦ ✦

(1) Any order for plastics molding machinery accompanied by a PD-3A certificate for delivery to the Army, Navy, Maritime Commission, War Shipping Administration, the Panama Canal, the Coast and Geodetic Survey, the Coast Guard, the Civil Aeronautics Authority, the National Advisory Committee for Aeronautics, and the Office of Scientific Research and Development. This section does not cover privately operated plants or shipyards or other enterprises even though they may be financed or controlled by government agencies.

(2) Any order for machinery accompanied by a PD-3A certificate for delivery to or for the account of governments of the United Nations.

(3) Any order placed by the United States Government pursuant to provisions of the Lend-Lease Act.

(4) Any order bearing a preference rating of A-9 or higher assigned by a Preference Rating Certificate PD-3 or PD-3A countersigned prior to the effective date of the order; or by a preference rating order in the P-19 series issued prior to the effective date of the order; or by a preference rating certificate PD-1 or PD-1A or preference rating order P-19-h issued at any time. In addition, PD-3A certificates can be used only to assign rating to approved orders.

(5) Any order authorized by the Director of Industry Operations.

✦ ✦ ✦

APPROVED orders in the fourth and fifth classifications above which were on the books as of the

date of issuance of the order (July 4, 1942) must be delivered within thirty days. Orders which are not approved but which were on file at the time the order was issued must be authorized by the Director of Industry Operations through application on Form PD-554. Such applications should be marked for the attention of the Special Industrial Machinery Branch.

✦ ✦ ✦

PROVISION is made in the order for production of maintenance and repair parts in instances where an actual breakdown has occurred or where inventories have fallen below a workable minimum.

✦ ✦ ✦

Government Orders Based on Standards

BOLTS, Nuts, Screws and Rivets (Maximum Price Regulation 147)—Lists schedules of sizes for which prices are established, the sizes being selected from sizes established in American Standards for bolts, nuts, screws, and rivets. States: "The following types and sizes of bolts, nuts, screws and/or rivets are assumed to be manufactured to either American Standards Association's specifications or United States Department of Commerce National Bureau of Standards Handbook H28 or British Standards Association's specifications, all as in effect on the effective date of this Maximum Price Regulation 147."

✦ ✦ ✦

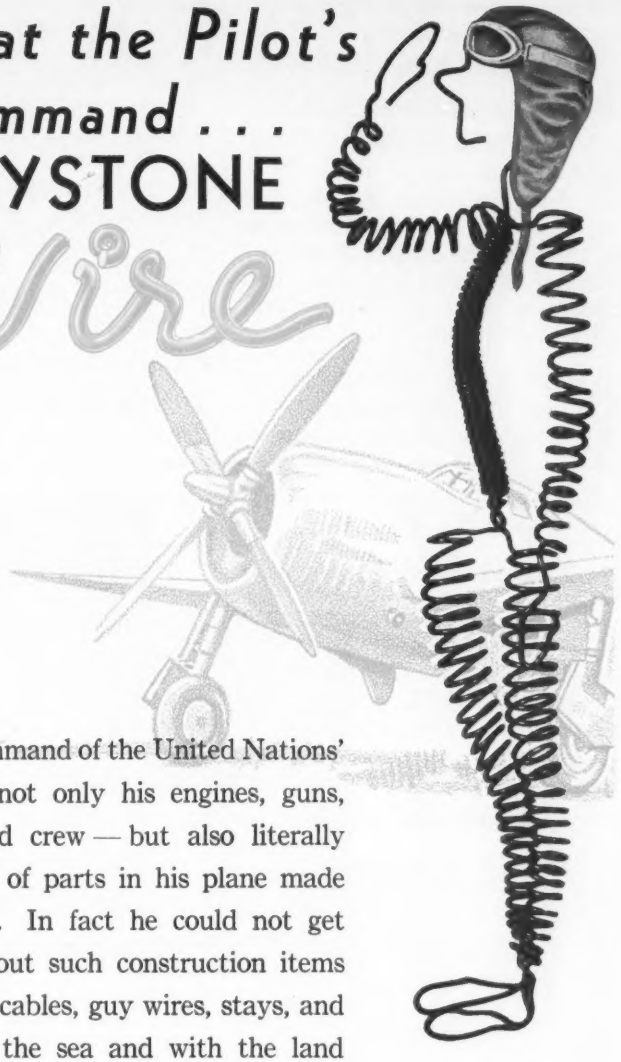
RUBBER Products and Materials of which Rubber Is a Component (Amendment to Supplementary Order M-15-b-1) — Amends specifications to prohibit use of rubber, latex, or reclaimed and scrap rubber as insulation on the neutral wire of a grounded neutral system.

✦ ✦ ✦

IRON and Steel Scrap (Amendment 5 to Revised Price Schedule 4-1) — Defines No. 1 heavy melting steel, and No. 2 heavy melting steel.

(*Please turn to Page 414*)

Also at the Pilot's Command . . .
KEYSTONE *wire*



At the command of the United Nations' pilot are not only his engines, guns, bombs and crew — but also literally thousands of parts in his plane made from wire. In fact he could not get aloft without such construction items as control cables, guy wires, stays, and bolts. On the sea and with the land forces, too, as well as in the air . . . wire is definitely at war, "drafted for the duration". Keystone, side by side with the Country's other wire makers gladly holds itself at the command of the main job at hand.

KEYSTONE
STEEL & WIRE CO. Dept. W PEORIA, ILLINOIS

HIGH CARBON OR LOW CARBON
SAMSON SPRING WIRE
REG. U.S. PAT. OFF.
KEYSTONE STEEL & WIRE CO. PEORIA, ILL.
Bright-Tinned
Coppered
Annealed
Galvanized

Government Wire Production Information

(*Continued from Page 413*)

Wire & Cable Makers Meet With WPB Officials

THE Wire and Cable Industry Advisory Committee held its first meeting with representatives of the War Production Board. A lengthy discussion took place as to what steps may be taken to facilitate the filing of various forms.

✦ ✦ ✦

AMONG the forms discussed were PD-175 which is required to be filed by customers desiring to purchase copper or copper-base alloy products. The forms must be filed with the suppliers. In this connection it is to be noted that Chief of the Copper Branch, **H. O. King,** has pointed out that after July 31st no deliveries of copper or copper-base alloy products will be authorized if orders for same are not accompanied by Form PD-175 properly filled out. He said that end-use classification must be clearly shown.

✦ ✦ ✦

CONSIDERABLE time was devoted to the procedure of filing forms PD-123-A revised, and PD-123-B revised. PD-123-A ties in with the allocation classification system and deals exclusively with deliveries of copper or copper-base alloys for military uses. Form PD-123-B covers deliveries of copper or copper-base alloys for industrial and civilian uses.

✦ ✦ ✦

THERE was no action taken at the meeting on suggestions offered for cutting down clerical work involved in filing the forms.

✦ ✦ ✦

THE Advisory Committee is composed of the following members: **W. E. Sprackling,** Anaconda Wire and Cable Co.; **S. E. Jones,** Okonite Co.; **Everett Morss,** Simplex Wire Co.; **C. A. Scott,** Rome Wire and Cable Co.; **Wylie Brown,** Phelps Dodge Copper Products Corporation; **Dwight R. G. Palmer,** General Cable Corporation.

✦ ✦ ✦

Household Repairs Allowed By WPB

AMENDMENTS to Orders M-21 and M-21-b have been issued by the Director of Industry Operations to permit the sale of unrated orders of fence wire, barbed wire, poultry netting, fence posts, gates, staples, and corrugated roofing and siding because these items are constantly being used by householders and farmers for maintenance and repairs.

✦ ✦ ✦

ALSO included in the amendment to M-21-b is an optional change in the quota basis for wire and wire products delivered to warehouses.

✦ ✦ ✦

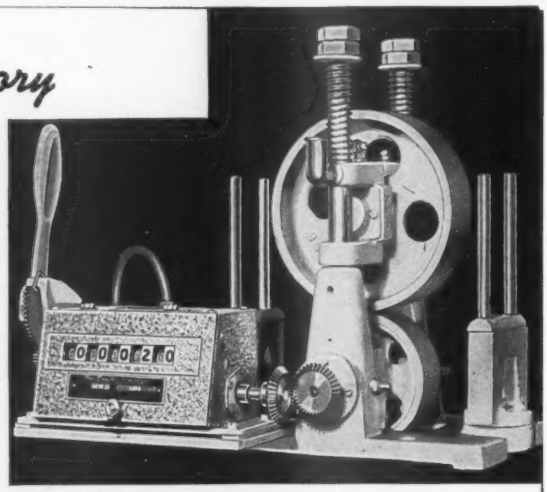
Brass Used in One Razor Would Make 3 .30 Caliber Cartridges

THE WPB order freezing sale of safety razors by manufacturers and jobbers, except to the armed forces, makes interesting these facts about safety razors.

✦ ✦ ✦

THE safety razor industry turned out about 10,000,000 units last year, using 1,662,000 pounds of brass in the process. That's enough to make 31,578,000 .30 caliber cartridges or 3,947,000 cartridge clips for the Garand rifle. The brass used in one razor one-sixth of a pound, would produce three .30 caliber cartridges.

Your Victory Production Program demands *Accurate Production* "Count"



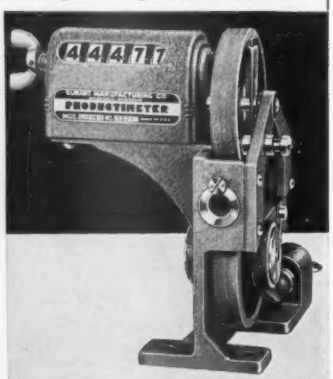
WITH **PRODUCTIMETER**
WIRE MEASURING MACHINES

Action . . . every minute of every day, from every machine on the industrial "first line of offense!" That is your part in the fight for Victory. Nothing must stop you and in that determination, Productimeters can help you vitally . . . by keeping accurate, automatic count of machine out-put. No guesswork, no manual checking and re-checking . . . no priceless man-hours wasted in getting facts and figures for production control.

Investigate your counting methods at once. If they are not suited to the emergency pace, act at once to equip your machines with up-to-the-minute Productimeters.

The line includes units for every wire measuring requirement . . . for every type of product: Insulated Cable, Wire, Rope, Chain, Braid, Bare Copper Cable, rough-surfaced Conductor, greasy, oily materials. Speeds from 500 to 5,000 counts per minute . . . Diameters from 0" to 3½" . . . and they're strong and durable, designed to do the work you expect of them.

Send for Complete details in Catalog No. 3



Above: Type ME with Predetermined Counter having Quick Lever Reset for instantaneous resetting. Automatically stops machine or signals operator when predetermined quantity has been run.

Right: Model L-H-16-1 with Wing Nut Reset. Designed for general service, moderately priced. Also available with Lock and Key Reset, or Quick Lever Reset.

DURANT MANUFACTURING COMPANY
1918 N. Buffum St., Milwaukee, Wis. 176 Eddy St., Providence, R. I.

PRODUCTIMETERS
THE SPEEDOMETERS OF INDUSTRY

Rubber Curb for Insulated Wiring Covers All Military Uses

WPB July 10 revised its specifications governing the use of rubber in insulated wire and cable and made them applicable to all military uses in order to save an additional 150 to 200 tons of crude rubber per month.

✦ ✦ ✦

SPECIFICATIONS which had been in effect until July 10 were applicable only to insulated wire and cable being made for civilian uses.

✦ ✦ ✦

THE new specifications, incorporated in Amendment 8 to Order M-15-b-1, are applicable to civilian orders, war orders, and all other orders placed by governmental agencies. An exception is made for certain types of wire and cable which require heavier than normal insulation, such as submarine cable, military field communication wire, and specially designed naval and aviation cable.

Iron & Steel Users May Appeal To WPB

MANUFACTURERS who consider themselves subjected to undue hardships as a result of General Conservation Order M-126, which prohibits use of iron and steel in hundreds of common products, may file appeals on Form PD-437 with the nearest WPB field office. An Appeals Branch has just been created to consider such requests. Later, the Branch will hear appeals from other conservation and limitation orders.

✦ ✦ ✦

Employment of "Learners"

IF you employ learners in your plant, heed these rulings by Wage-Hour Administrator Walling: (1) Learners must be listed on your payroll as a separate group. (2) Records of any experience learners may have had during the previous 5 years must be kept on individual statements signed by the learners. (3) No certificate issued by the Wage-Hour Administrator may authorize the employment of learners in **more than one plant.**

✦ ✦ ✦

Communications Inventories

RESTRICTIONS on inventories in the radio and wire communications industries have been modified so that material for specific Army, Navy and other war projects may be stocked without interference with normal operating inventories.

✦ ✦ ✦

THIS action was taken in interpretations of Preference Rating Orders P-129 and P-130.

✦ ✦ ✦

Small Diamond Dies Under Complete Allocation Control

SMALL diamond dies, used in drawing wire essential in making many electrical combat instruments such as detectors, radios, and fire-control apparatus, were placed under complete allocation control July 1 by General Conservation Order M-181.

(*Please turn to Page 418*)

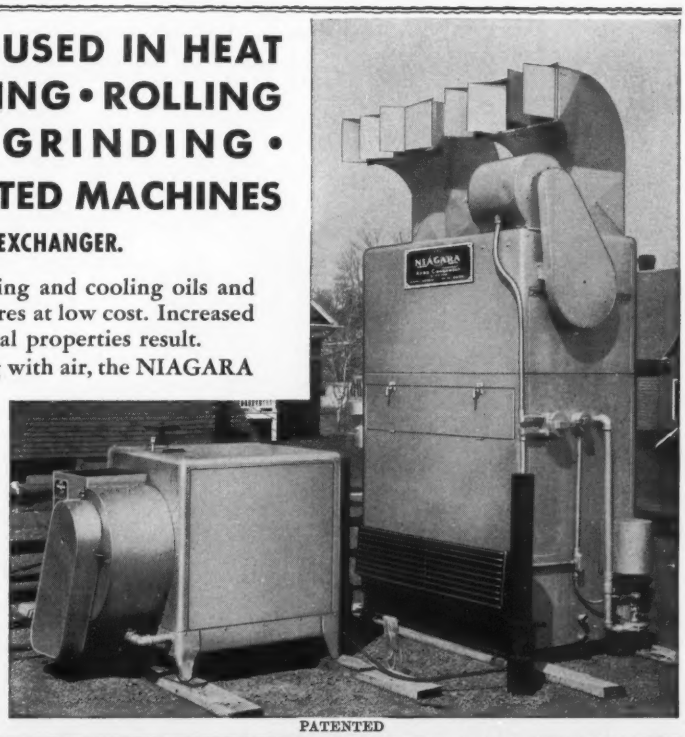
FOR COOLING LIQUIDS USED IN HEAT TREATING • WIRE DRAWING • ROLLING • BROACHING WET GRINDING • CUTTING • WATER JACKETED MACHINES

***use the* NIAGARA AERO HEAT EXCHANGER.**

Quenching baths, cooling solutions, lubricating and cooling oils and jacket water are kept at controlled temperatures at low cost. Increased production, decreased spoilage, better physical properties result.

Applying the principle of evaporative cooling with air, the NIAGARA HEAT EXCHANGER cuts the cost of cooling water 95%, saves power, costs less to install than conventional cooling equipment. Closed system prevents adulteration of cooling liquid.

Recovered heat is available for plant heating. Write for Bulletin #90.



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NIAGARA BLOWER COMPANY

6 E. 45th Street Dept. WP-82 New York City

37 W. Van Buren St., Chicago, Ill.
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673 Ontario St., Buffalo, N. Y.

Sales Engineers in Principal Cities

NIAGARA *INDUSTRIAL* COOLING • HEATING • DRYING HUMIDIFYING • AIR ENGINEERING *EQUIPMENT*

Outstanding Personalities of the Wire Industry

P. P. Somerville, Gen. Mgr., Gilmore Wire Rope Division, Jones & Laughlin Steel Corp.

THE appointment of **P. P. Somerville** to succeed the late Robert Gilmore as General Manager of the Gilmore Wire Rope Division of the Jones & Laughlin Steel Corporation has been announced.

✦ ✦ ✦

MR. SOMERVILLE has been with Jones & Laughlin since 1938 when he started with the company to supervise installation of equipment in the plant then under construction at Muncy, Pennsylvania. When the new plant went into production he was appointed Superintendent which position he has held since.

✦ ✦ ✦

MR. SOMERVILLE'S entire business experience has been in the wire rope business, having entered the production division of the Williamsport Wire Rope Company in 1929 upon his graduation

P. P. SOMERVILLE

from the University of Notre Dame as a mechanical engineer.

Sidney Rolle, Asst. Secy., AMCO Magnesium Corporation

FRIENDS and acquaintances of **Sidney Rolle,** who for many years has been a Director of the Wire Association and Assistant Manager of the Scomet Engineering Company of New York, will be glad to learn that Mr. Rolle has been appointed Assistant Secretary of the Amco Magnesium Corporation with executive offices at 61 Broadway, New York.

✦ ✦ ✦

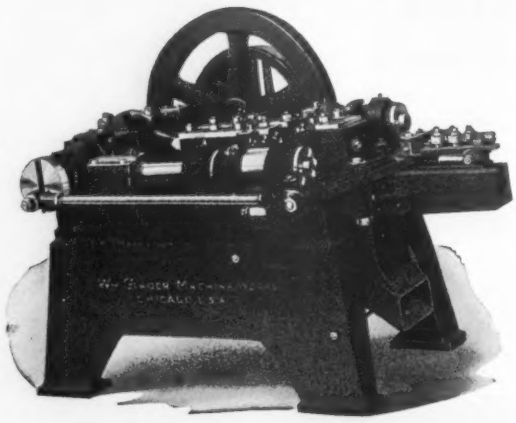
MR. ROLLE also retains his former connection as assistant manager of the Scomet Engineering Company with headquarters at 420 Lexington Avenue, New York, N. Y.

✦ ✦ ✦

American Steel & Wire Changes

BURTON H. GEDGE, assistant to vice-president in charge of operations of American Steel & Wire Co., U. S. Steel subsidiary,

HIGH SPEED WIRE NAIL MACHINE



WM. GLADER MACHINE WORKS

210 N. Racine Ave. Chicago, Illinois

Glader Machines on large head, single-blow roofing nails can be seen in operation at any of the independent wire mills in the United States.

The production figures on common nails shown below, are guaranteed.

SIZE MACH.	SIZE WIRE	MAX. LENGTH OF WIRE	NUMBER OF NAILS PER MIN.	CAP. IN POUNDS PER HR.
#00A	#16	1⅛"	700	37.2
#00	#14	1¼"	550	55
#0	#12	1¾"	450	89
#1	#10	2½"	400	192
#2	#8	3½"	325	310
#3	#4	5"	225	523
#4	#1	7"	190	622
#4s	5/16"	9"	175	1155
#5	⅜"	12"	160	2400

This high output and economical operation account for the GLADER machine being accepted as standard equipment in all recent installations.

has been promoted to new duties specializing in production activities of the vice-president's office.

✦ ✦ ✦

HARRY L. JENTER also has been made assistant to vice-president and will concentrate in office work for the vice-president. At the same time **J. Dell Baster** has been promoted to general superintendent of the Cuyahoga Works, Cleveland; **Charles M. Sackerson,** superintendent of the cold rolling mills at Cuyahoga, and **James W. Futhey,** general foreman of cold rolling at the same plant.

✦ ✦ ✦

AT the Joliet, Ill., Works of the American Steel & Wire Co., **George H. Bendell** has been made superintendent of factories and **Henry W. Spitzhoff** has been named superintendent of the wire mill at Joliet. Mr. Bendell formerly was assistant general superintendent at Joliet, while Mr. Spitzhoff has been chief industrial engineer since 1938.

✦ ✦ ✦

Charles C. Buckley, American Lanolin Corporation

WE regret to announce the death of **Charles C. Buckley** of the American Lanolin Corporation, Lawrence, Mass., on July 15th, 1942. Mr. Buckley had been in charge of the activities of the Company for many years and his loss will be keenly felt by his many friends.

✦ ✦ ✦

C. W. Meyers, Sales Dept., American Steel & Wire Company

C. W. MEYERS has been appointed special representative in the aviation field with the manufacturer's products division of the sales department of American Steel & Wire Co., U. S. Steel subsidiary. In his new post Mr. Meyers will handle the company's affairs with aircraft manufacturers and suppliers and will lend his advisory services as regards stainless steel particularly. In addition springs, control cables and systems, electrical wires and cables and other products where they relate to aircraft will fall within the scope of his activity.

✦ ✦ ✦

MR. MEYERS has been assistant manager of the metallurgical department of American Steel & Wire since 1937. For the past four years he had concentrated on metallurgical problems of special steels, and is an expert on such matters in their application to aircraft construction.

✦ ✦ ✦

BORN in New Philadelphia, O., he is a graduate of Case School of Applied Science in Cleveland and the Harvard Graduate School of Business Administration. He started with the company as an acid tester in the cleaning house at Cuyahoga Works, Cleveland, and has held various positions since that time.

Due to war conditions
WIRE & WIRE PRODUCTS
has suspended delivery of the magazine to the following countries:
AUSTRIA, BELGIUM, CHINA, CZECHOSLOVAKIA, FRANCE, GERMANY, HOLLAND, ITALY, JAPAN, JUGOSLAVIA, NORWAY, POLAND, PORTUGAL, ROUMANIA, SPAIN, SWEDEN and SWITZERLAND.

All subscriptions unfulfilled at the time of discontinuance will be completed after we have won the war.

It may be costing you production and profits to think "all Carbide Dies are alike". They're NOT!

There are as many differences among carbides as there are among steels. These differences affect hardness, density, uniformity, and wearing qualities. They have a strong influence on results with regard to amount of wire produced, accuracy to size, quality of finish and—to a substantial extent—the physical properties of the wire.

Although your eye cannot detect the quality of a carbide die, you can see it in your production records.

TECO CARBIDE DIES have a background of long experience and carefully controlled development that offer the users a definite production bonus.

Prove it with a test. Keep a record of the additional output of on-size wire—examine the finish and accuracy—then standardize on TECO DIES.

Tungsten Electric Corporation manufactures

WIRE and BAR DIES — EXTRUDING DIES — SIZING DIES — TUBING DIES . . . *also Carbide blanks, tools, bits and special tools.*

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564 39th Street • • • Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Pioneers in Tungsten Carbides for Over a Quarter Century

Government Wire Production Information

(*Continued from Page 415*)

ALL "small diamond dies," those having a diameter of 0.0015 inch or less, may not be bought, sold, transferred, or delivered without specific authorization by WPB, and the Director of Industry Operations may specify how dies are to be used. Each supplier of dies is also directed to set aside, at once, all stocks of small dies as a reserve against future allocation orders by the Director of Industry Operations.

✦ ✦ ✦

SUPPLIERS of dies are required to file Form PD-559 with WPB on or before the fifteenth of each month, and consumers of dies must file Form PD-560 at the same time.

WIRE WORK WANTED

Due to curtailment of the manufacture of springs for furniture and bedding, we have a large capacity available for drawing and straightening both commercial spring and low carbon wire.

Also equipped to handle the drawing and straightening of aluminum, brass and copper wire.

Behind our facilities is 20 years experience in the best wire mill pickling and drawing practice, in a plant with a capacity for drawing 300 tons of wire weekly. Work held to close tolerances. Commercial spring wire drawn down to 20 gage and low carbon wire down to 23 gage.

Besides handling drawing and straightening, we can manufacture special wire forms and shapes to your specifications.

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To those wire mills and wire product fabricators whose orders exceed present capacity, we call attention to these facilities to help speed the production of war and essential products. Orders handled promptly and accurately.

Address inquiries to

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Greater Rolling-Mill Capacity for Canada

EXPANSION of Canada's steel rolling-mill capacity is indicated by press reports of new installations, the rebuilding of an old plate mill, and the addition of new rolling-mill capacity.

✦ ✦ ✦

OF the 1,828,589 short tons of scrap iron and steel consumed in Canada in 1940, 1,323,501 tons were used in steel furnaces, 46,050 tons in rolling mills, 45,920 tons in ferroalloy furnaces, 28,691 tons in iron blast furnaces, and 9,427 tons in furnaces processing artificial abrasives. In 1940 the scrap consumed by steel furnaces, averaging 72.4 percent of the total, was made up of 541,582 tons of scrap originating in consuming works and 781,919 tons collected throughout the country.

✦ ✦ ✦

IMPORTS into Canada of scrap iron and steel rose sharply in 1940 — to 415,981 short tons — compared with 177,564 tons in 1939. Exports, on the other hand, dwindled to 3,261 short tons in 1940 from 93,837 tons in the preceding year.

✦ ✦ ✦

Carbide Tools Increase Efficiency

(*Continued from Page 404*)

TO determine the total amount of motor horsepower required by the machine when switching to carbide tools, it is of course necessary to add to the above figure the horsepower lost in driving the machine itself at the higher speeds recommended for carbide cutting tools. This is usually estimated at around 30% of cutting horsepower.

✦ ✦ ✦

Higher Horsepower With Less Torque

ACTUALLY in a great many cases when a job is switched from high speed steel to carbide tooling, the amount of torque and the tool loading is decreased. As a matter of fact, in some cases particularly on extremely large work, it is actually necessary to decrease the tool load to make the carbide tools perform properly.

CARBIDE tools, inherently, cannot take as great a maximum loading (pressure) as can high speed steel tools. On extremely large work where slow speeds have been used with deep cuts and large feeds, it is sometimes necessary to decrease the feed to prevent tool breakage. This decrease is, of course, more than made up in metal removal by the increased speed at which the cutting is done.

✦ ✦ ✦

FOR instance, let us take a typical large job tooled with high speed steel tools with the following performance:

OD of work .....36 inches
Depth of cut .....½ inch
Feed .....3/16 inch
Maximum Cutting Speed, 40 ft. per min. (40 x 12 in/min)
Horsepower required for Cutting .....22½ hp
The amount of metal removed here is 45 cubic inches per minute (½ x 3/16 x 40 x 12).

✦ ✦ ✦

NOW when this job is tooled with carbides, let us assume the following operating conditions:

Depth of cut .....½ inch
Feed .....Reduced to 3/32 inch
Speed .....Raised to 125 ft. per min.

✦ ✦ ✦

HERE is what has happened:

✦ ✦ ✦

THE amount of metal removed is now 70 cubic inches per minute, a gain of 55%. Horsepower required for cutting has been increased to around 35 hp., an increase likewise of 55%.

✦ ✦ ✦

BUT tool load, or pressure, has been reduced 50% since the feed and therefore the cross-section of the chip, is reduced 50%, and torque on the work and chuck has been reduced 50% for the same reason.

✦ ✦ ✦

THUS, while the rate of metal removal and the horsepower required have gone up, the tendency of the work to slip in the chuck has been cut in half, the tendency to twist has been cut in half and the tendency to distort the work by cutting pressure has also been reduced 50%.

✦ ✦ ✦

AT the same time, finish has been improved by means of the finer feed used, tool life between grinds has been increased due to the harder carbide tools, and the amount of down-time has been decreased in proportion.

If You Are Not A Member Of The Wire Association—Now Is A Good Time To Join!
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For detailed information address
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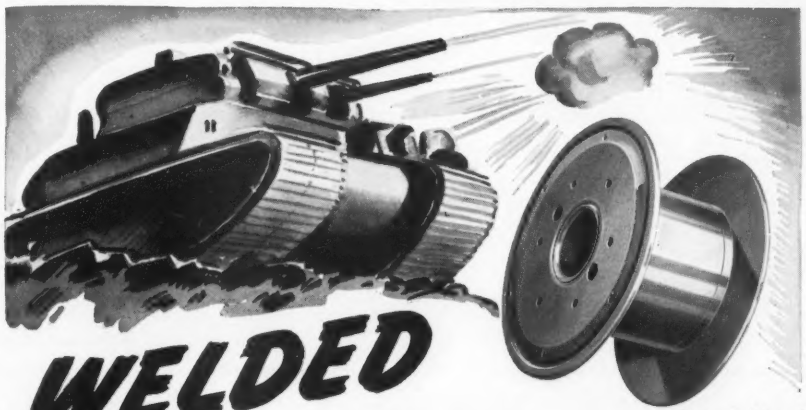

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TO BE STRONGER
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To America's newest type tanks and Hubbard steel spools and reels, welded construction gives greater strength and rigidity per pound of total unit weight.

An essential advantage in tank operation, such greater strength is also important in your wire production operations. Hubbard steel spools and reels, electro-welded wherever formed parts are joined, can better withstand the rough usage and wear of today's war time production pace. Designed and balanced for smooth vibration-free rotation, the dependable, long life of Hubbard equipment has been demonstrated and proved in every step of wire manufacture where spools and reels are used.

You are invited to write for the full facts on Hubbard products and methods. Our engineers will be happy to work with you on the proper selection and design of spools and reels for any operation for any type of wire, either copper or steel.

HUBBARD SPOOL COMPANY
1624 CARROLL AVENUE | CHICAGO, ILLINOIS
Since 1912, manufacturers of wire drawing and annealing, and shipping spools and reels.

A Review of Recent Wire Patents

No. 2,284,659, THREAD ROLLING DIE, patented June 2, 1942 by Richard T. Hosking, Wilmette, Ill., assignor, by mesne assignments, to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

A pair of relatively shiftable die members are provided for simultaneously acting upon opposite sides of a screw blank, at least one of the die members having thread producing ridges, and a thread altering section associated with at least one of these die members and including a work shifting surface disposed out of working alignment with the ridges and operable when a screw blank is rolled between these die members to produce in the side surface of a thread convolution a thread shifting surface extending out of helical alignment with respect to the normal thread convolutions produced by the ridges.

✦ ✦ ✦

No. 2,284,883, SECURING MEANS FOR SCREEN CLOTH, patented June 2, 1942 by Loren Glenn Symons, Hollywood, Calif., assignor to Nordberg Manufacturing Company, Milwaukee, Wis., a corporation of Wisconsin.

It is stated that no clamps, bars nor binding means is needed for the screen mesh itself, and mesh of variously diametered wires may be tensioned.

✦ ✦ ✦

No. 2,284,904, ABRASIVE WIRE POLISHER, patented June 2, 1942 by Louis Illmer and Vernon R. Pallas, Cortland, N. Y.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

This polisher is of the abrasive tape type, with no fast moving parts, except the moving wire itself.

✦ ✦ ✦

No. 2,285,167, WIRE STRIPPER, patented June 2, 1942 by Robert J. Montgomery, Chicago, Ill.

It is said this stripper is adapted to handle heavy or light wire, and to remove insulation without distorting the wire.

✦ ✦ ✦

No. 2,285,229, CONTROL SYSTEM, patented June 2, 1942 by Frederic M. Roberts and Lucius A. Norris, Schenectady, N. Y., assignors to General Electric Company, a corporation of New York.

This device is adapted to winding a predetermined fabric a varnish coating colored to correspond to the color of the metal to be simulated and serving to protect the light reflecting surface against oxidation and leaving the surface visible by light reflected through the coating.

No. 2,286,194, PROCESS FOR MAKING GALVANIZED ARTICLES, patented June 16, 1942 by Albert F. Bradley, Sterling, Ill., assignor to Northwestern Steel and Wire Company, Sterling, Ill., a corporation of Illinois.

An object of the invention is to anneal the interior of cold-drawn steel wire, while retaining at least some of the strain, and residual metal pattern in the surface and then galvanizing the wire.

✦ ✦ ✦

No. 2,286,339, INSULATED CONDUCTOR, patented June 16, 1942 by Andrew C. Buerk and Edward Haberberger, St. Marys, Pa., assignors to Stackpole Carbon Company, St. Marys, Pa., a corporation of Pennsylvania.

More specifically, this relates to insulated wire, used as shunt conductors of electric brushes used in generators, motors, etc.

✦ ✦ ✦

No. 2,286,695, MACHINE FOR ASSEMBLING AND/OR DISASSEMBLING THE PARTS OF SPRING TENSIONED DEVICES, patented June 16, 1942 by Asa J. Taylor, River Forest, Ill.

Wire springs for valve assemblies of internal combustion motors may be placed and removed with this device.

✦ ✦ ✦

No. 2,286,759, METHOD OF MAKING INSULATED WIRE OF SMALL OR IRREGULAR CROSS SECTION, pat-

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

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Cablers
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Armor. Machines
Tapers
Juters
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Saturating Tanks
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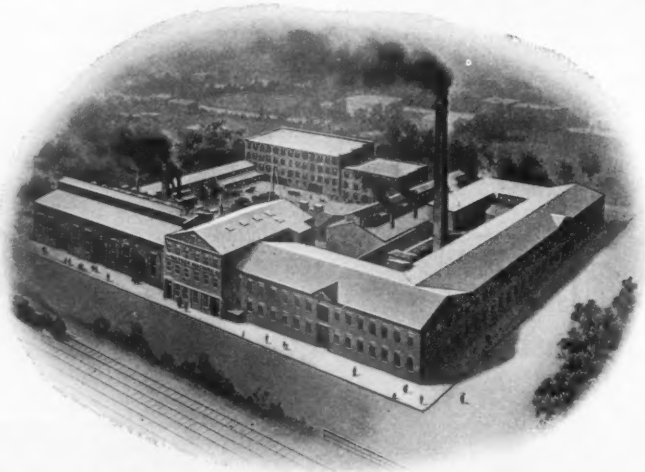

Let-offs
Gang-Spoolers
Re-winders
Capstan Takeups
Continuous Takeups
Heavy-Duty Takeups
Traverses
Measuring Mach's.
Testing Mach's.
Vulcanizers
Polishers
Reel Crutches

MEAS. MACH'S. TRAVERSES, REEL CRUTCHES, BUNCHERS, SMALL POWDERERS, ETC. — USUALLY CARRIED IN STOCK

LITERATURE AVAILABLE ON ALL LISTED UNITS

ented June 16, 1942 by Winton I. Patnode, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

The method comprises coating the conductor with a liquid coating composition comprising the reaction product of an aldehyde and a hydrolyzed polyvinyl ester, baking the coated conductor to harden the coating thereon, continuously drawing the coated conductor through a wire drawing die to alter the diameter thereof, and annealing the drawn conductor.

✦ ✦ ✦

No. 2,286,826, PORTABLE POWER CABLE, patented June 16, 1942 by James J. Morrison, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

Anti-friction surfaces (of cellophane) are disposed between the rubber-filled tape insulation and the rubber fillers, underneath the jacket.

✦ ✦ ✦

No. 2,286,827, ELECTRIC CABLE AND METHOD OF MANUFACTURE, patented June 16, 1942 by James J. Morrison, Worcester, Mass., assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

Crepe paper envelops the conductors and extends into the valleys between the conductors, an outer jacket of thermoplastic material having inwardly extending portions, to force the crepe paper into the valleys.

✦ ✦ ✦

No. 2,286,956, METHOD OF AND APPARATUS FOR DRAWING WIRE AND FABRICATING ARTICLES THEREFROM, patented June 16, 1942 by Paul W. Dillon, Sterling, Ill., assignor to Northwestern Steel and Wire Company, Sterling, Ill., a corporation of Illinois.

A combined wire drawing and wire fabricating machine is provided having a device for continuously heating the wire between the drawing stage and the tensioning stage.

✦ ✦ ✦

No. 2,287,074, ATTACHMENT FOR SCREW MACHINES, patented June 23, 1942 by Nathaniel Young, Kittery, Maine.

More specifically, this relates to a thread cutting attachment.

✦ ✦ ✦

No. 2,287,589, WIRE COATING DIE, patented June 23, 1942 by Irving H. Wilson and Alexander G. Beaver, Lynn, Mass., assignors to General Electric Company, a corporation of New York.

This die may be employed to coat wire, rectangular in cross section, and to coat wire which may have irregularities in its surface.

✦ ✦ ✦

No. 2,287,947, WEATHERPROOF INSULATED ELECTRIC WIRE, patented June 30, 1942 by Richard W. Shoemaker, Woodbury, Conn., assignor to Chase Brass & Copper Co., Incorporated, Waterbury, Conn., a corporation.

Over the wire conductors are coatings of asphaltum and ethyl cellulose, the outer coat of the completed conductor assembly also being of the same.

✦ ✦ ✦

No. 2,288,512, MULTIPLE STRAND FOURDRINIER WIRE, patented June 30, 1942 by William E. Buchanan, Appleton, Wis., assignor to Appleton Wire Works, Inc., Appleton, Wis., a corporation of Wisconsin.

The fabric comprises at least some warp and weft wires having cores of soft metal with casings of harder metal.

✦ ✦ ✦

New Homo Tempering Catalog

ANYONE concerned with the problem of war-speed tempering, annealing or stress-relieving of big loads . . . of expediting work through the heat-treat, yet obtaining such highly uniform physicals that rejects are said to be practically eliminated . . . should find of value the newly-revised Homo tempering catalog just issued by **Leeds & Northrup Company.**

✦ ✦ ✦

IT contains new data and new charts. There are many new pictures showing how the method is helping to overcome heat-treating bottlenecks in industry's battle of production. For your copy of this helpfully illustrated 29-page publication, write to Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia, Pa., and ask for Catalog T-625, "Homo Method For Tempering."

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NEW Ready-Reference WALL CHART
Standard Wire Gauges—diameters, footage per pound in 5% phosphor bronze, factors for conversion to other materials; composition and physical properties of 15 available alloys. On vest pocket card if preferred. Write today for your free copy.

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Callite meets Callite very frequently in American industry. For example, many radio tube manufacturers specify Callite radio tube parts. To insure perfect contact when in service, certain of these parts are highly polished to remove oxide formed during processing. For this important purpose, no finer scratch brushes are made than the NEWARK BRUSH COMPANY'S Type "5"— fashioned from Callite stainless steel wire.

The fact that engineers in many fields agree on Callite, whenever and wherever they demand the best in wire, is eloquent evidence of Callite quality. Callite's high standards guarantee dependable uniformity in wire composition, temper, tolerance and finish. If you have a special problem call on the knowledge and resourcefulness of Callite technicians. Callite Tungsten Corporation, 572 — 39th Street, Union City, N. J. Branches: Chicago, Cleveland.

Callite Wires

A FINE WIRE FOR EVERY NEED

The Effect of Copper on Hot-Dip Zinc Coatings

(*Continued from Page 396*)

in the zinc coating may therefore be assumed to have at least produced no visible harmful effects, and may have actually been beneficial in so far as corrosion resistance was concerned.

THIS seems to completely cover all of the material available on the subject of importance. As stated absolutely no definite facts have been found on the subject anywhere, so that this discussion is submitted for the purpose of stimulating some careful experiments on the actual facts in so far as copper additions in very small amounts to zinc coatings is concerned. As a summary and final statement it would appear that the very best product that can be produced, is a galvanized product with a copper-bearing steel base metal, a copper-bearing zinc coating, a weight of zinc coating that is the heaviest consistent with the purpose for which the galvanized product is to be used, and finally the highest skill in galvanizing technique in applying the zinc coating.

✦ ✦ ✦

RESEARCH experiments conducted by the **American Socity for Testing Materials** on zinc coatings without copper, and zinc coatings with copper, and on base metals without copper, and with copper, should furnish an excellent field for future investigations to improve the qualities of corrosion resistance of zinc coatings. The technical literature indicates that small additions to the zinc will perhaps be as valuable in adding to corrosion resistance as small additions of copper to steel. It certainly appears to be the next logical direction for research investigations to improve the quality and corrosion resistance of hot-dipped zinc coatings.

✦ ✦ ✦

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(2) **Research on the Corrosion Resistance of Copper Steel, by D. M. Buck, Jour. Ind. and Eng. Ch. (American Chemical Society) March 1916 - Volume 8, page 209.**

(3) (a) **Facts Simply and Briefly Told Concerning Keystone Copper Steel.**

(b) **The Testimony of a Decade.**

(c) **Copper Steels Resist Corrosion. An Established Fact. A Summary of the Conclusions of the Scientists.**

(d) **The Influence of very low percentages of Copper in Retarding the Corrosion of Steel.**

(e) **Research on the Corrosion Resistance of Copper Steel.**

(f) **A Review of the Developments of Copper Steel.**

(g) **Observations Upon the Atmospheric Corrosion of Commercial Sheet Iron. Particularly in Regard to the Influence of Copper and Mill Scale.**

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An immersion in ACP's CUPRODINE produces a dense, adherent coating of copper which substantially reduces wear on dies, cuts time over the electrolytic method, saves plating equipment, bus bars and copper electrodes.

ACP also offers—from its war-to-war experience in metal treatment and finishing—RODINE, the inhibitor used in pickling after annealing, which produces a smooth pickled surface and minimizes embrittlement. In severe draws, this latter is of great importance.

•

Other ACP Products that contribute to the war effort are: DEOXIDINE to prepare steel, aluminum and dural for painting; LITHOFORM for coating galvanized iron to hold paint; FLOSOL, an exceptional soldering flux; KEMICK for protecting metal surfaces even when heated red-hot, and other special chemicals vital to the better, cheaper, faster finishing of metals.

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* These are Bulletins by The American Sheet and Tin Plate Company, Pittsburgh, Pa.

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Chart Showing Effect of Price Control in Limiting Price Advances

A CHART depicting the effect of price control in limiting price advances in various groups of commodities during the 33 months from August, 1939, to April, 1942, has been released by the Office of Price Administration.

✦ ✦ ✦

CONSIDERING that OPA only embarked on formal price controls in the Spring of 1941—18 months after the outbreak of the war—the chart gives ample evidence of the effectiveness with which the selective ceilings and agreements with producers operated to hold down prices in those fields where coverage was reasonably broad.

✦ ✦ ✦

THE General Maximum Price Regulation was issued on April 28, 1942, and brought under an over-all ceiling the balance of virtually all commodity groups

(*Please turn to Page 424*)

Our completely modern manufacturing facilities have enabled us to meet delivery dates for Syncro equipment now urgently needed to produce the wire products essential to the war effort.

And our present accelerated research and development program is producing many advancements that foreshadow some mighty forward steps in Syncro equipment for the Victory years ahead.

SYNCRO MACHINE COMPANY

Rahway, New Jersey — McCormick Bldg., Chicago

Represented in Canada by Canadian Elevator Equipment Co., Ltd., Toronto

Chart Showing Effect of Price Control in Limiting Price Advances

(*Continued from Page 423*)

used in the chart. Most raw farm commodities still are free of control because of the special standards set in the Emergency Price Control Act of 1942. Processed farm products, however — bread, canned goods, most meats, etc.— are covered by the General Regulation.

✦ ✦ ✦

IN the case of metals and metal products, 92 percent of which were under OPA controls on April 18, 1942, the chart shows that price increases were held to 12 per cent over the 33 months. In sharp contrast, farm products, only 4 percent controlled by last April, rose about 72 per cent during the same period.

✦ ✦ ✦

CONVERSION of the chart's "bars" for the various commodity groups into figures, giving the percentage extent of OPA control and the percentage increase in prices, yields the following table.*

Commodity Group	Percent Under control on April 18, 1942	Percent Price Increase Aug. '39 - Apr. '42
Metals and metal products	92	11
House furnishing goods	89	20
Fuel and lighting materials	79	7
Miscellaneous	63	23
Lumber and building materials	50	23
Textile products	39	44
Hides and Leather products	32	29
Foods	27	47
Chemicals and allied products	25	31
Farm products	3	71

✦ ✦ ✦

GROUPING the various commodities by raw materials, semi-manufactures, and manufactures, the chart presents in picture form the following figures:**

	Percent under control on April 18, 1942	Percent Price Increase Aug. '39 - Apr. '42
Raw Materials	40	50
Semi-manufactures	94	25
Manufactures	52	25

✦ ✦ ✦

A COPY of the chart may be obtained by addressing Office of War Information, care of Office of Price Administration, Washington. D. C.

ROBINSON TUBE-TYPE **WIRE STRANDERS**

Dynamically Balanced! No Vibration!

IN this new Robinson Tube-Type Wire Strander are embodied the suggestions of engineers and operators of numerous wire cable plants throughout the country. As a result of careful study and field contact, this machine now meets the most exacting requirements of the industry. Frame, main and take-off bearing mounts, gear housing and base are of all-welded construction—as structurally stable as though cast in a single unit. Steel tube of high tensile strength is statically and dynamically balanced. Gear box is designed to produce any lay within the range of lays required for its size and type. All high-speed gears are fully enclosed; they operate in a continuous oil bath. Supporting rollers of the best quality highly compressed fibrous material are mounted on spindles running in adjustable ball bearings. Bobbin latches and bobbin brakes are of new design and semi-automatic in operation.

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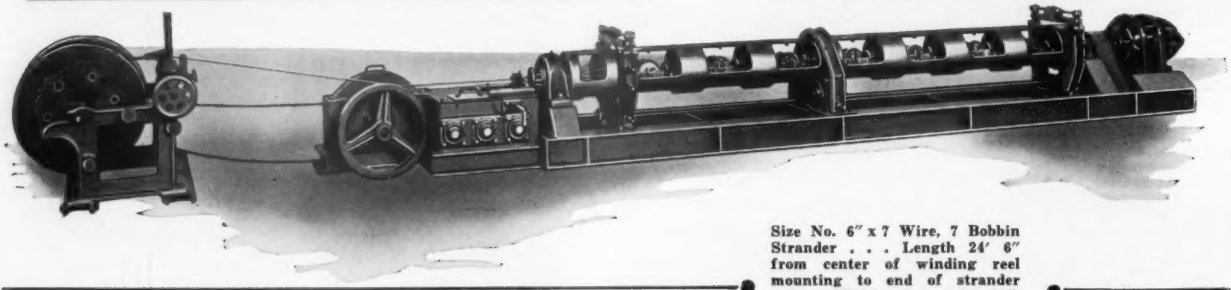

Size No. 6″ x 7 Wire, 7 Bobbin Strander . . . Length 24′ 6″ from center of winding reel mounting to end of strander motor. Width of strander 31″. Approximate gross weight for domestic shipment 3,000 lbs. Reel stand shipping wgt. 450 lbs.

ROBINSON MANUFACTURING COMPANY
WORKS — MUNCY, PENNA.
Sales & Executive Offices — **30 CHURCH STREET . . . NEW YORK, N. Y.**

UNIQUE

A Discussion of Coated Electrodes and Their Properties

(*Continued from Page 399*)

but should try the few variations in technique to which attention has been called in this article. More often than not, he will find that the rod that he condemned, because of lack of familiarity with it, will give satisfactory results when properly handled.

✦ ✦ ✦

IT must not be forgotten that a welding rod is really a **tool** and, that the results obtained can only be as good as the welder's skill and familiarity with the rod he is using, PLUS his enthusiasm for the particular make of rod. It is a well known fact that if ten expert welders make a test of any rod, there will be just ten different results, although each may be well within the minimum requirements of the test; and furthermore, no welder can exactly duplicate any test that he makes. Many factors enter into the equation, such as the welder's comfort, whether or not he is self-conscious in making a test, tired from loss of sleep and other minor matters, but all of which prove that a welding rod is a **tool** and its use an art, into which enters strongly the human element.

✦ ✦ ✦

IN summing up, it may be said that the heavy protected arc coatings on electrodes have proven to be the most important development in the welding industry and the present acceptance of electric welding in shipbuilding, tanks and other ordnance production is due entirely to this development, as by their use, the welds are now from 35 to 50% stronger than the parent metal, thus providing a tremendous factor of safety, far in excess of riveted construction.

Remember Sam in the Sunday comics? All his experiences started with: "I seen yo' ad in de paper." YOU see the advertising of leading concerns in WIRE & WIRE PRODUCTS. When writing them, please say you saw their ad in WIRE & WIRE PRODUCTS. Advertising service is fundamentally American.

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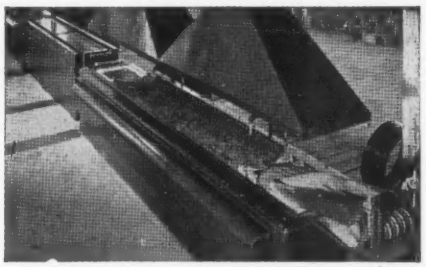
Wire Mill Installations of TRAUWOOD equipment for the continuous strand heat treatment of wire, rod and strip have proved:

Higher and More Uniform Physical Properties!

Faster Speeds — Greater Production!

Extreme Flexibility!



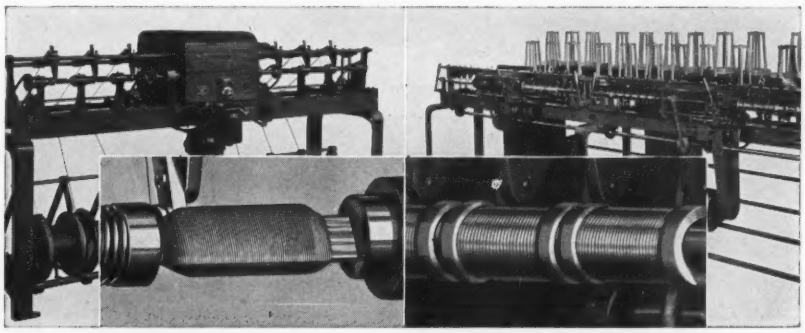
Trauwood Electric Wire Tempering and Patenting Unit

Investigate this newest development in the scientific heat treatment of carbon and alloy steel rod, wire and strip. Write today.

THE TRAUWOOD ENGINEERING COMPANY

1740 E. 23rd STREET, CLEVELAND, OHIO, U.S.A.

WIRE SPOOLING MACHINES



On Sticks or Spools . . . from Reels or Coils

Typical of FIDELITY Spooling Machines that you find serving every spooling-operation need of wire industry, these two new types command attention to advanced achievements in precision winding of the wire onto little flat sticks or conventional spools, at new high production rates and new low spooling cost.

You'll be interested especially in the new FIDELITY hydraulic control which eliminates gear changes . . . so write for Bulletin #61.

WIRE SPOOLING, TAPING, WINDING, SINFRA KNITTING, BRAIDING MACHINES

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA, PA.

INCREASE WIRE PRODUCTION
with BRIGHTER FINISH LONGER DIE LIFE TRUER-TO-GAUGE

Get out fast! But hold on to the quality!
That's the order of the day in every wire mill in the country. That means using the right kind of wire drawing compounds — a good reason why you should investigate

FOR EXAMPLE

Magnus 57WD is giving outstanding results on the dry drawing of low and medium carbon wire single and multiple pass, particularly on the new high-speed machines. It gives a lubricating film of high strength and adhesion leading to a high finish and longer die life.

MAGNUS WIRE DRAWING SOAPS FOR FASTER, QUALITY OUTPUT

Among the various soaps in our standard line you will probably find a compound that will help you speed production and improve quality on one or more of the kinds of wire you draw.

If you have a tough drawing problem calling for a specially compounded soap, we are anxious to work with you to solve it.

We'd like to send you a copy of our bulletin covering the Magnus line of Wire Drawing Soaps. Let us know if you want more than one copy.

MAGNUS CHEMICAL COMPANY
Manufacturers of Cleaning Materials, Industrial Soaps and Metal Working Lubricants.
188 South Avenue — Garwood, N. J.

MAGNUS CLEANERS

Catalog on Rubber Linings

A NEW catalog section on its Vulcalock Rubber Linings for handling corrosives has been published by **The B. F. Goodrich Company,** Akron, Ohio, and a copy can be obtained by addressing the company direct.

✦ ✦ ✦

IN this section it is pointed out that satisfactory rubber linings have been developed for handling most inorganic acids, except strong oxidizing agents such as nitric, chromic and concentrated sulphuric, as well as for most inorganic salts and alkalies, and many organic chemicals.

✦ ✦ ✦

A VALUABLE feature of the new section is a table listing over 100 of the most common services for which Vulcalock Rubber Linings are suited, giving the limits of temperature and concentration of the fluid in each case.

Have You a Drawing Problem?

WIRE DRAWING LUBRICANTS
for every purpose

G. WHITFIELD RICHARDS
1732-36 Carlton St.
PHILADELPHIA, PA.

Protects Surfaces

IN these days when every bit of lost motion or material spoilage, puts off the day of Victory for democracy, it becomes important to see that materials or work in storage or transit is protected against rust and corrosion.

✦ ✦ ✦

PARALAN, a protective coating material manufactured by the **American Lanolin Corporation,** Lawrence, Mass., is especially useful to manufacturers and finishers of sheet, strip and wire to reduce production costs and cut rejects. Products protected by Paralan are not slippery, are easily cleaned and leave surfaces in good condition for plating, lacquering, enameling and so forth.

✦ ✦ ✦

THE Corporation has prepared informative mailing pieces describing the characteristics of Paralan and wil be glad to mail these to interested persons on request.

IMMEDIATE RECOGNITION!
ACCORDED THIS FOUR-STAR BOOK

★ Practical ★ Original ★ Interesting ★ Complete

From all quarters has come commendation of this latest ASM book on practical metallurgy. Already four famous engineering schools—Case School of Applied Science . . . University of Wisconsin . . . Brooklyn Polytechnic Institute . . . Stevens Institute of Technology — are planning to use this book as a textbook for their courses in metallurgy.

Typical of other responses is that from Dr. Zay Jeffries, General Electric authority, who says: "The book constitutes a valuable addition to the literature of metallurgy".

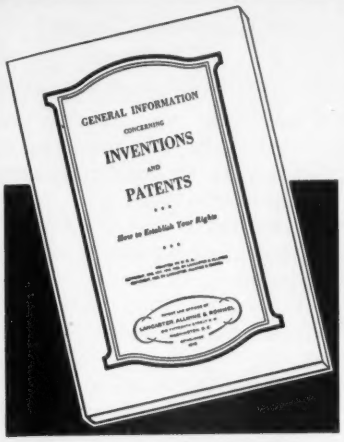
If you haven't ordered your copy, do so today. You'll agree when you receive "Practical Metallurgy" that this is the finest book on this subject available today.

PRACTICAL METALLURGY
Applied Physical Metallurgy — Industrial Processing of Ferrous and Nonferrous Metals and Alloys
by
GEORGE SACHS,
Case School of Applied Science
and
KENT R. VAN HORN,
Aluminum Company of America
570 Pages . . . 355 Illustrations . . . 6x9 . . . Red Cloth Bound
$5.00

In addition to 335 general illustrations, PRACTICAL METALLURGY contains 160 constitutional diagrams covering all systems that contain an important commercial alloy. These diagrams . . . the chapters on Plastic Deformation of Ferrous and Nonferrous Metals . . . and the chapter on Internal Stress in Metals contain information not available in any other book published in this country.

Here is the book you've long wanted — a simple yet complete treatise on practical metallurgy.

WIRE & WIRE PRODUCTS
300 Main Street — Stamford, Conn.



Send for a copy - it's free.

Interesting Booklet concerning Inventions, Patents, Trade-Marks and Copyrights, together with Schedule of Government and Attorney's fees, sent free on request. Simply ask for "booklet and fee schedule."

No charges are made for preliminary advice, either in connection with patent, trade-mark or copyright cases.

Lancaster, Allwine & Rommel
Registered Patent & Trade-Mark Attorneys
438 Bowen Bldg., Washington, D. C.

If you MAKE or USE WIRE
YOU NEED ONE OF THE MANY

Porter Cutters

Indispensable in wire mills for sampling large wire.

In almost universal use by wire fabricators for cutting reinforcing fabric, fencing, spring wire, etc.

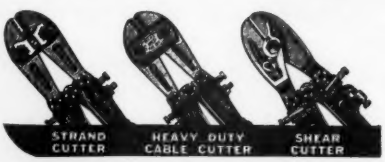
Useful in any plant—large or small—for all sorts of maintenance and repair work—for cutting bolts, rods, wires, rivets, wire rope, chains, or for splitting deformed or "frozen" nuts.

There is a standard Porter tool for every cutting job up to ¾" annealed bolts or ½" hardened chains. Special cutters designed to fit your industry's needs.

Send for Catalog of PORTER CUTTERS.

SEND FOR CATALOG

H. K. PORTER, INC.
EVERETT, MASS.



Spool Copper Wire

TEMPORARY procedures for the acquisition of spool copper wire by wholesalers and its resale by them for automobile repair use were announced today by the War Production Board.

✦ ✦ ✦

GENERAL Preference Order M-9-a, as amended, requires WPB authorization to sell any copper products on orders not rated A-1-k or higher. Under the new plan worked out jointly by the Distributors', Copper and Automotive Branches, a wholesaler, distributor or jobber may apply on Form PD-1X for authority to receive and release automotive spool copper wire to be used for primary, secondary and battery cables on automobiles and motorcycles. No other uses will be authorized by PD-1X.

✦ ✦ ✦

ALL applications for this authority must indicate the exact status of inventories and sales of this type of wire. If an applicant's inventory does not constitute a 60-day supply, consideration will be given to the necessity of replenishing his stock in order to assure availability of material for the essential uses permitted.

✦ ✦ ✦

WHERE inventories are in excess of a 60-day supply, permission may be granted to release stipulated amounts of wire for the specified purposes.

✦ ✦ ✦

Watch Out For This One!

HOTEL reservations may be made by members of the Wire Association direct with the Hotel Carter, Cleveland, Ohio, **prior to September 28th.** After that date no more reservations will be accepted for a specific hotel, but will all be referred to the Central Housing Bureau of The American Society for Metals for allocation to such hotel as may have space available. **Watch out for this — Make your plans now to attend and send your reservation card in promptly.**

WAR ORDERS MEAN NEW CLEANING JOBS?

Are you busy on war orders which require cleaning operations that are unusual, different, new? For example, are you putting **BLACK FINISHES** on screws, hooks, springs or other wire products?

Then you, too, can use specialized Oakite War-Time Service to good advantage. Based on 33 years' experience and a vast knowledge of successful degreasing and cleaning practices, this service offers you the complete cooperation of Nation Wide Field Staff, Chemical Research and Mechanical Engineering Laboratories, as well as valuable manuals and data sheets.

ALL these facilities are freely available to help you solve your war production degreasing problems. Your inquiry invited.

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52A THAMES ST. NEW YORK, N. Y.
Representatives in All Principal Cities of U. S. and Canada

OAKITE CERTIFIED CLEANING
MATERIALS · METHODS · SERVICE

NEW RICHMOND
Kentucky Avenue Just Off Boardwalk
ATLANTIC CITY, N. J.

★

European Plan—
Moderate Rates

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ALL OUTSIDE ROOMS, MOST OF WHICH HAVE OCEAN VIEW

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AMPLE LOBBIES AND PARLORS IN A SPIRIT OF HOME-LIKE REFINEMENT

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Write for Literature and Rates

William Kneller, Owner

WIRE MACHINES FOR

Drawing, Enameling, Tinning, Spooling, Insulating with Glass, Asbestos, Paper Tape, Cotton, etc. Multiple Pull-outs, Rubber covered wire Panners, etc.

One of our numerous types of Multiple Pull-outs and Take-ups for use in connection with Tinning, Annealing, and Saturating Processes, etc.

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"American" INSULATING MACHINERY COMPANY

517 West Huntingdon St.

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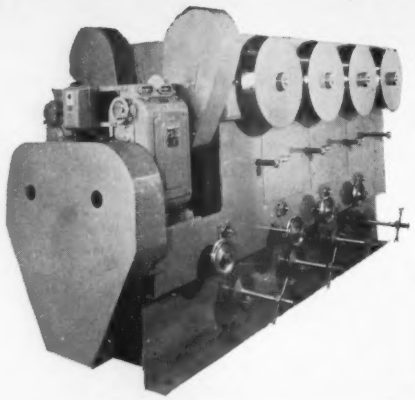
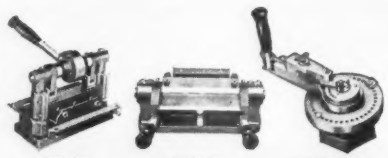


DI-ACRO

"DIE ACCURACY WITHOUT DIES"

PRECISION MACHINES



SHEAR BRAKE BENDER

The DI-ACRO SYSTEM of

METAL DUPLICATING without Dies!

For 1 piece—500—5,000 or 50,000—here is fast die-less duplicating accurate to .001". Time has an A-1-A priority these days.

Write for Catalog

O'NEIL-IRWIN MANUFACTURING CO., 303 8th Ave. S., Minneapolis, Minn.

WIRE MILL EQUIPMENT by "STANDARD"

TURKS HEADS

Adjustable draw plates—accepted by wire trade as accurate, efficient means of producing rectangular and special shapes. With friction or power driven rolls. Catalog TH.

DRAW BENCHES

8 sizes, 2 general types. Machines are of one-man type with all controls at die end. Catalog DB.

ROLLING MILLS—STRIP AND WIRE

Roller bearing and plain bearing mills; many regular sizes or made to suit user's specific needs. Write fully.

SWAGING MACHINES

For reducing diameter of tubular and solid bar stock into cylindrical, conical, or "necked" shapes. Capacities from ½" tube, ¼" solid to 6" tube or 3¾" solid. Catalog SM.

ALSO

Hand Screw, Foot, and Power Presses; Drop Hammers, and Scrap Bundlers.

✓ your needs for this equipment and write for catalogs.

STANDARD MACHINERY CO., PROVIDENCE, R. I.

STEEL WIRE

By MAURICE BONZEL

Translated and Published by

KENNETH B. LEWIS, Consulting Engineer

PRICE $15.00

495 Pages — 414 Illustrations

SEND ORDERS TO

WIRE and WIRE PRODUCTS

300 Main Street Stamford, Conn.

Interim Revision to Electrical Code Will Conserve Copper And Rubber

THE chairman of the Sectional Committee on the National Electrical Code, sponsored by the National Fire Protection Association, announces adoption by the committee under the tentative interim amendment procedure of the following note to be inserted following Section 3004 of the 1940 edition of the National Electrical Code:

"Note: For the duration of the defense emergency and to assist in the conservation of copper and rubber, conductors having Code grade rubber insulation that are not operated continuously with maximum currents may have the allowable current - carrying ratings that were given them in Table I of the 1937 edition of this Code and the limits of allowable current because of more than three conductors in a raceway (Note 5, page 303, 1940 text) and because of room temperature being over 30 C (Table I, page 301, 1940 text) need not be applied."

✦ ✦ ✦

Productimeter Booklet

THE Durant Manufacturing Company, 1918 No. Buffum Street, Milwaukee, Wisconsin, announces the publication of a new bulletin, "No. 100," designed for the convenience of all department heads interested in production, time study, cost accounting and research in industrial plants. The book gives in compact form details on the Productimeter line of standard counting and measuring machines, is profusely illustrated, and will be of valuable help in determining the Productimeters needed for industrial counting and measuring uses.

✦ ✦ ✦

THE majority of applications are filled by standard models of Stroke, Lineal, and Rotary types of counters, and with the accent today on greater speed in the essential industries, it is vital that every piece, every part, every machine operation be accurately counted to avoid waste of time and effort, to permit the direction of precious man-hours into the most needed channels.

✦ ✦ ✦

A COPY of this handy reference bulletin will be sent on request to the **Durant Manufacturing Company.**

Steel Warehouses to Continue Filling Emergency Orders

THE War Production Board now permits steel warehouses to continue their necessary function of filling emergency orders for small amounts of steel.

✦ ✦ ✦

WAREHOUSES stocks have been depleted because warehouses have been required to sell on ratings as low as A-10 and have been able to replenish supplies only on top ratings.

✦ ✦ ✦

TO correct that condition, after August 1 warehouses shall not sell on ratings lower than A-1-a, except for maintenance and repair, with some specific exceptions.

✦ ✦ ✦

IN addition, the new order, Amendment No. 6 to M-21-b, provides that warehouses must operate under all other delivery restrictions applicable to steel producers.

✦ ✦ ✦

MAINTENANCE and repair parts may be delivered below A-1-a ratings, provided that deliveries in any calendar quarter do not exceed these percentages of the total quarterly quota of a warehouse for such products:

Stainless steel products	**3 per cent**
Tool steel products	**3**
Other alloys	**3**
All other steel or iron products	**5**

✦ ✦ ✦

FLAT rolled products below prime grade may be delivered down to A-3 ratings and cast iron soil or culvert pipe larger than 4-inch down to A-10. Nails, bale ties, small pipe, fence wire and posts, poultry netting, steel roofing and similar products may continue to be delivered on lower rated or unrated orders.

✦ ✦ ✦

DELIVERIES of oil well casing, pipe and tubing are exempted by today's action from the general restriction on carload shipments by warehouses. Carload shipments of these products may be made by warehouses without restriction, but this exemption does not relieve warehouses from complying with Price Schedule 49 issued by the Office of Price Administration.

CONTINENTAL STEEL CORPORATION ★ SUPERIOR WIRE

WIRE FOR A THOUSAND USES

Continental SUPERIOR wire is used in the manufacture of hundreds of everyday items. This versatile wire is produced in sizes from 34 gauge to ⅝ inch, in standard and many special shapes . . . and in correct analyses, tempers and coatings to fill exacting requirements. The different combinations of specifications available are numbered in thousands.

CONTINENTAL STEEL CORP., KOKOMO, INDIANA
(The Superior Sheet Steel Co., Canton, Ohio — a subsidiary

CONTINENTAL STEEL CORPORATION

SHEETS: Black, Galvanized, Copperized, Hot and Cold Rolled, Special Coated, Long Terne, etc.

WIRE: Bright Basic, Annealed, KOMIK, Copperized, Tinned, Special Manufacturer's, etc.

WIRE DRAWING LUBRICANTS

HIGH OR LOW CARBON WIRE, COLD HEADING, BRIGHT AND WET WIRE DRAWING.

STANDARD "WIRE DRAW"

SPECIALLY ADAPTED FOR HIGH SPEED DRAWING MACHINES
BETTER FINISHED WIRE — LOWER DIE COSTS

STANDARD INDUSTRIAL COMPOUNDS CO.

4600 FERDINAND STREET CHICAGO, ILLINOIS

NILSON AUTOMATIC PRESS AND FOUR SLIDE MACHINE

FOR SWAGING, STAMPING, PIERCING, BLANKING, FORMING OF COILED METAL

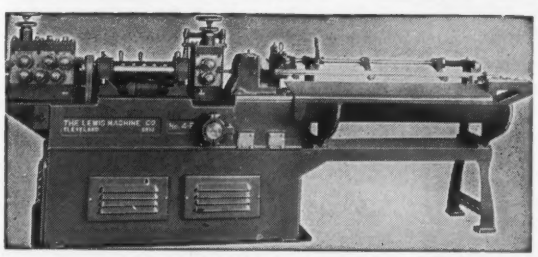
WE also build machines for forming Paper Clips, Buckles, Gate Hooks, Coat and Hat Hooks, Ceiling Hooks, Wire Ears, Cable Rings, Screw Eyes, Sash Chains, Automobile Side Chains, Flat Open Link Chains, Staples, Cotter Pins, Hose Clamps, Etc., and Wire Straighteners, Wire Reels, Frame Bending Machines and Special Presses.

For Complete Details Address —

THE A. H. NILSON MACHINE CO.

BRIDGEPORT, CONN., U. S. A.

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to ¾" rod

Round
Square
Flat
Hexagon

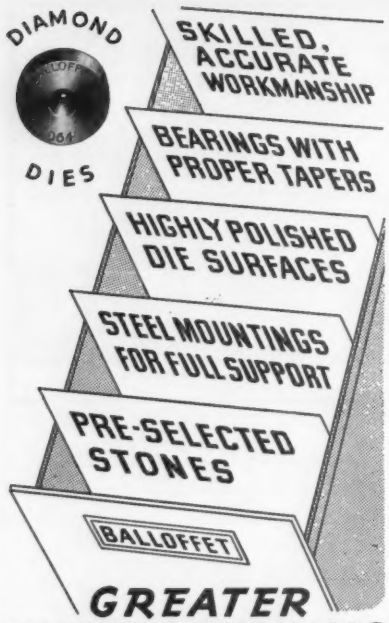
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

The Sign of Dependable Service:

WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

THE LEWIS MACHINE CO., 3445 E. 76 St., Cleveland, Ohio



GREATER WIRE-DRAWING MILEAGE RECORD

BALLOFFET
DIES AND NOZZLE CO., Inc.
6825 Adams St., Guttenberg, N. J.
Quality Diamond Dies Since 1870

Be Sure to Specify

WILLEY'S
TUNGSTEN CARBIDE DIES

- WIRE DRAWING
- EXTRUSION
- SIZING

They have exceptional abrasion resistance, are free from porosity and take a high polish. Standard one-piece round dies from stock in many sizes. Four classifications from blank and rough cored nibs to finished dies, ready to use.

WRITE FOR CATALOG
Full information on all sizes and classifications.
Sales Engineers in Principal Cities

WILLEY'S
CARBIDE TOOL CO.
MANUFACTURERS AND SPECIALISTS IN
TUNGSTEN CARBIDE TOOLS
1580 W. VERNOR HIGHWAY • DETROIT, MICHIGAN

"ALCOA" Presents New Motion Pictures

TO assist the service branches of the government and the war-effort industries in training workers in the fabrication and assembly of aluminum parts and structures, the **Aluminum Company of America** has produced three new motion pictures covering the welding, riveting and machining of aluminum, respectively.

✦ ✦ ✦

THE three sound motion pictures are definitely task-instruction films designed to teach workmen the art of handling aluminum in each of these subjects. The welding film, for instance, covers the technique of welding various kinds of joints, showing the preparation and application of fluxes, the right and wrong kinds of flames, the angles at which torch and rod should be held, and so forth. The picture covers torch welding, arc welding, spot welding and brazing.

✦ ✦ ✦

THESE excellent films, produced by the Jam Handy Organization may be borrowed or purchased from the Corporation. They are available in either 16 mm. or 35 mm. sizes.

✦ ✦ ✦

"OEM Handbook"

AN "OEM Handbook," describing the functions and organization of the war agencies within the Office for Emergency Management, was issued recently.

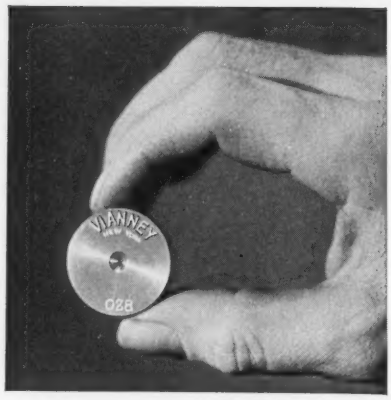
✦ ✦ ✦

THE 72-page booklet describes in detail the organization of the War Production Board, the Office of Price Administration and the other constituent agencies of the OEM. Personnel is listed in most cases down to the branch level in each agency. Included are organization charts of the WPB and the Bureau of Industry Branches of the WPB Division of Industry Operations, as well as a chart showing the relationship of the various Federal war agencies.

✦ ✦ ✦

COPIES of the booklet are available in room 1501, New Social Security Building and from the Superintendent of Documents, Washington, D. C., and at OEM field offices.

VIANNEY
Famous Wire Drawing Diamond Dies



These famous Diamond Dies are now produced here at moderate prices.

All sizes are in stock or made to order to your specifications

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250 E. 43rd. St. New York.
V. J. Boulin, Manager

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Diamond Dies for Wire Drawing

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Wire Drawing Diamond Dies

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DIAMOND AND CARBIDE WIRE DRAWING DIES
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Wire Drawing and Extrusion Dies
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STEEL REELS AND SPOOLS

Hy-Carbo Steel Co.
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EQUIPMENT AVAILABLE FOR REDRAWING ROUND WIRE
Less Ton Lots A Specialty
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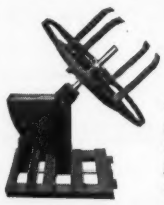
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Quickly and easily adjusted to any angle within 90 degrees. Cut shows one angle.
Write for circular R
THE F. B. SHUSTER CO.
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Straightener Specialists Since 1866

WIRE MACHINERY SPECIALISTS
3—Nilson No. 1, 3 & 4 4 Slide Wire Machines
5—Baird No. 4—Four Slide Wire Machines
7—Waterbury Step Cone Wire Drawing Machines
1—Two Spindle Bull Block Motor Driven
6—Lewis Welding Wire S. & C. Machines M. D.
2—Shuster Shaped Wire S. & C. Machines ½" & ¾" Square, Hexagon & Round Stock Capacities
8—Shuster Round Wire Straightening & Cutting Machines 1/32"-½"
Wanted: Tack Making Machinery. All Sizes.
NATIONAL MACHINERY EXCHANGE
128-138 MOTT ST. NEW YORK, N. Y.

Odd Lots
WIRE WANTED
For Bed Springs
A-8 Rating
FISCHER BED SPRING CO.
429 Lockhart St. Pittsburgh, Pa.

Unique Oil Displaces Water, Lubricates—Preserves Wet Metal Surfaces, and Removes Corrosive Primer Salts from Gun Bores

A NEW product is announced by Mr. A. F. Curran, Research and Development Chemist for The Curran Corporation, Dowling Building, Malden, Massachusetts, on which he has received a Patent describing a new use for GUNK, Self-Emulsifying Degreasing Solvent.

✦ ✦ ✦

GUNK is described as an oil having "Polar" characteristics. It will quickly lubricate and preserve wet metal surface from rust and is said to be especially valuable for treating gun bores or other metal surfaces which have been wet with salt water and require cleaning, lubricating, and a preservative treatment.

✦ ✦ ✦

IT is stated that the new oil has been found satisfactory as a lubricant cleaner-preservative and will remove salt and dehydrate the metal surfaces to which it is applied in one single convenient operation.

✦ ✦ ✦

FOR further details write direct to the **Curran Corporation,** Dowling Building, Malden, Mass.

✦ ✦ ✦

Williamsport Wire Rope Making Plant Addition

CONSTRUCTION has started on a one-story addition to the Williamsport Wire Rope division of the Bethlehem Steel Corporation according to an announcement by company officials. General contract for the new unit, to provide additional space for war work, is held by the Lundy Construction Company. It will be 60 by 230 feet in size and will cost more than $30,000 with equipment.

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In Wire Manufacturing & Wire Forming Equipment
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MOSLO MACHINERY, INC.
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✦ ✦ ✦

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✦ ✦ ✦

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Patented and Exclusive "3V" Principle Provides New Standard of Accuracy
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for
WIRE INDUSTRY
NEW ENGLAND BUTT CO.
PROVIDENCE, R. I.

APCO MOSSBERG CO.
the original Frank Mossberg Co.
Manufacturers of Reels and Spools
Attleboro, Mass.

SCOTT TESTERS
For WIRE, RUBBER, TEXTILES, PAPER, Etc.
HENRY L. SCOTT CO.
PROVIDENCE, R. I.

WIRE, WIRE ROPE AND ELECTRIC CABLE MACHINERY
THOMSON-JUDD
WIRE MACHINERY COMPANY
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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.

AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.

ALKALINE CLEANERS—
American Chemical Paint Co., Ambler, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Rahway, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery, Inc., Cleveland, O.
Ross, J. O., Engineering Corp., New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BERYLLIUM COPPER — Strip and Bars
Callite Tungsten Corp., Union City, N. J.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CASTINGS—Wire Mill
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

WHERE TO BUY, Continued

CLOTH—Wire, All Metals
Callite Tungsten Corp., Union City, N. J.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.

COLD HEADERS—
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Wire Drawing
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill

CONTROLS—Heat Treating
Niagara Blower Co., Buffalo, N. Y.

CONTROLS—Temperature
Niagara Blower Co., Buffalo, N. Y.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUSTOM WIRE DRAWING—
Hy-Carbo Steel Co., Lowell, Mass.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Callite Tungsten Corp., Union City, N. J.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIE MAKING MACHINERY — For Forming Special Shapes
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

DIES—Diamond
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Hillside, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Hillside, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIRECT ELECTRIC RESISTANCE HEATING—
Trauwood Engineering Co., Cleveland, Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING EQUIPMENT—
Niagara Blower Co., Buffalo, N. Y.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Humidifying
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Industrial Cooling
Niagara Blower Co., Buffalo, N. Y.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLASH BAKER—
Carl-Mayer Corp., The, Cleveland, Ohio.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engineering Co., Cleveland, Ohio.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engineering Co., Cleveland, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Hardening and Tempering
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Robertson, John, Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

GALVANIZING EQUIPMENT—
Wilson, Lee, Engineering Co., Cleveland, O.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—ROLL
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.

KETTLES — Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LUBRICANTS—For Metal Cutting Stamping and Drawing
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY — Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY — Die Making for Forming Special Shapes
O'Neil-Irwin Mfgr. Co., Minneapolis, Minn.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Quill Winding
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
National Erie Corp., Erie, Pa.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Taylor-Wilson Mfg. Co., McKees Rocks, Pa.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.

Machinery—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Inc., Brockton, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

WHERE TO BUY, Continued

OILS—Wire Drawing
Richards, G. Whitfield, Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Richards, G. Whitfield, Philadelphia, Pa.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

QUENCHING BATH CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery, Inc., Cleveland, O.
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TEMPERATURE CONTROLS—
Niagara Blower Co., Buffalo, N. Y.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Scott, Henry L., Co., Providence, R. I.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE DRAWING — High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Music
Jersey Steel & Wire Corp., Irvington, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

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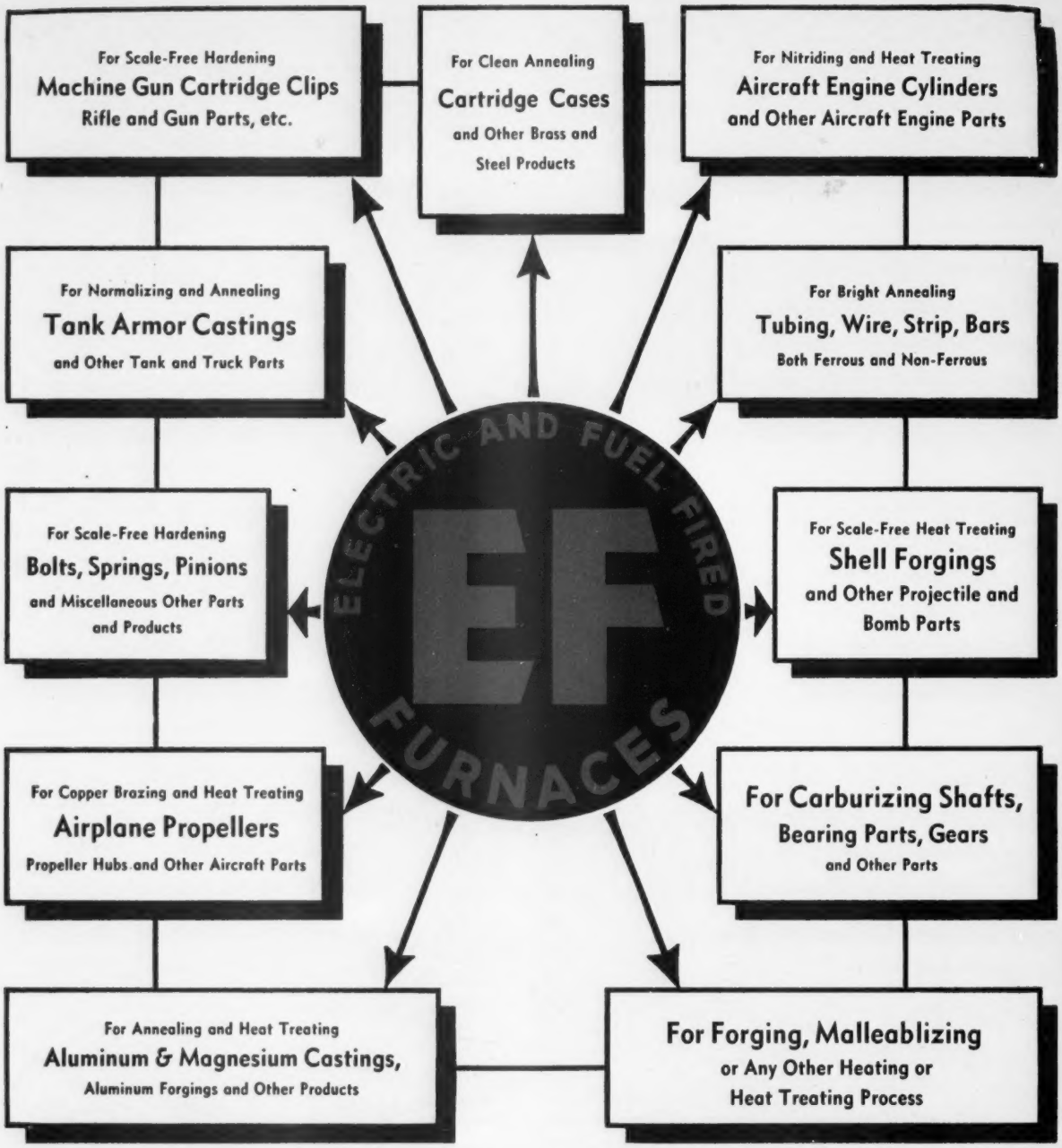

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